TATUNG®

SERVICE INFORMATION
COLOUR DISPLAY MONITOR

Code No. 79-1191-2

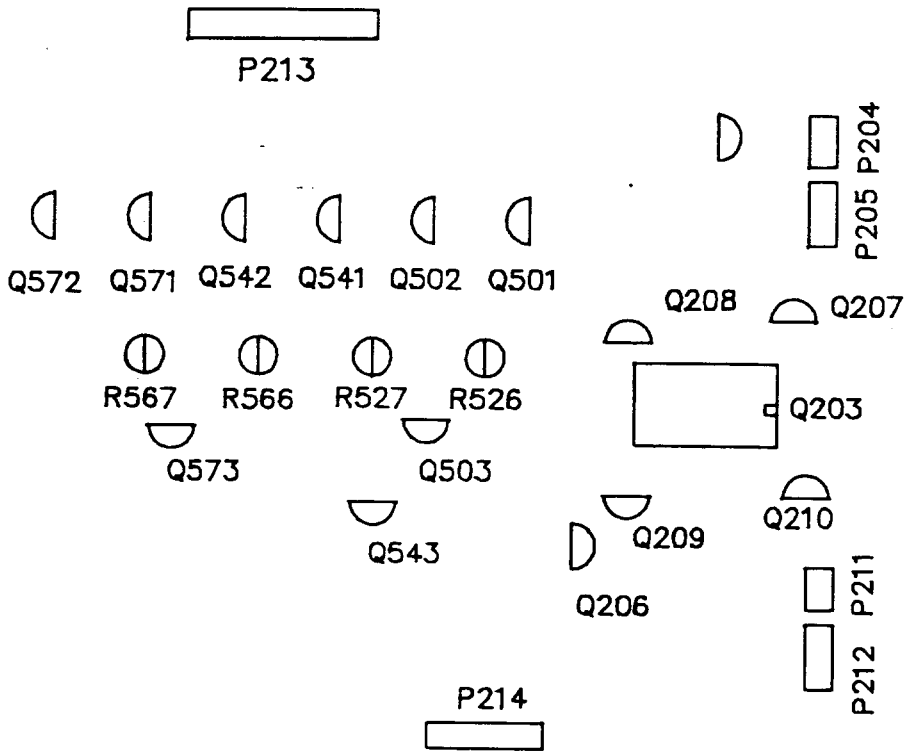


Fig 4-2 PCB-VIDEO DRIVE adjustment and test location

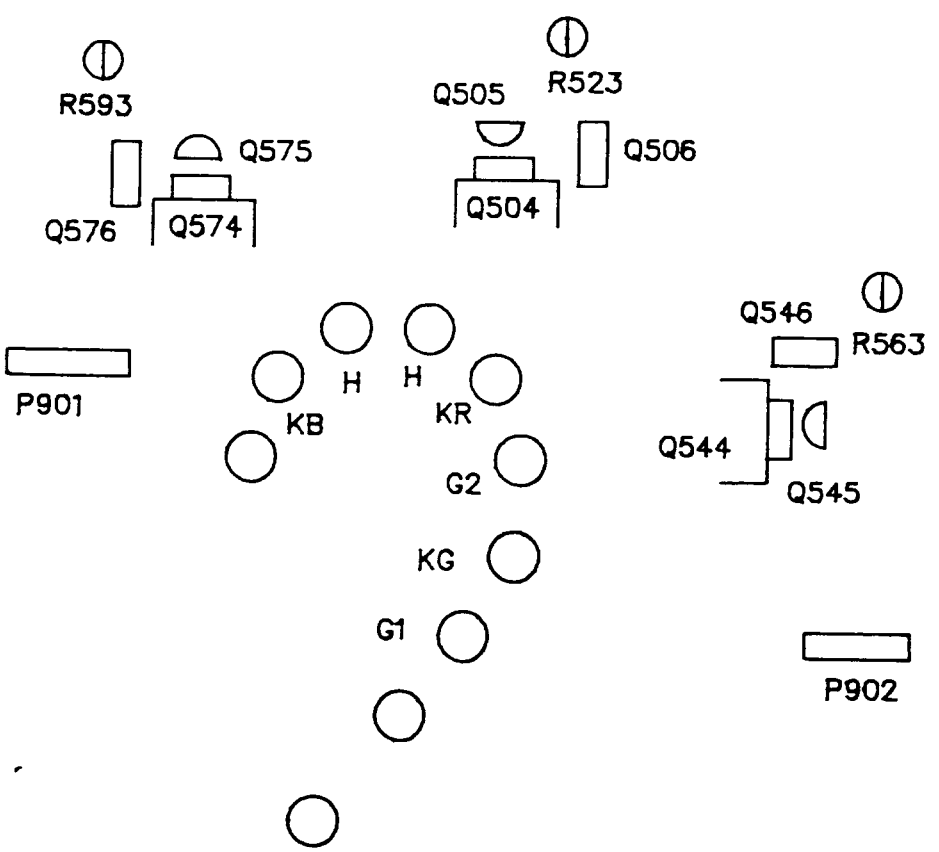


Fig 4-3 PCB-CRT DRIVE adjustment and test location

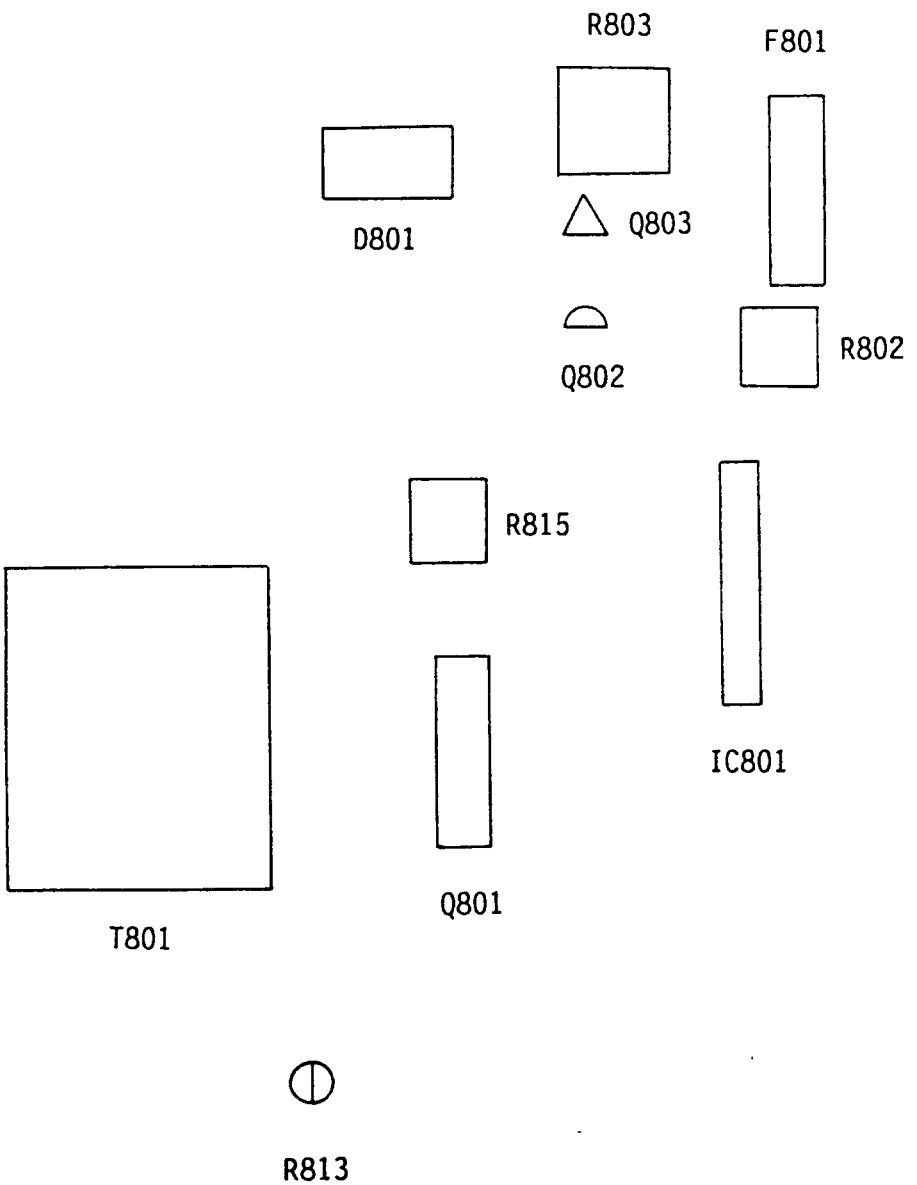


Fig 4-4 PCB-POWER adjustment and test location

CHAPTER 5

TROUBLESHOOTING

This chapter provides information on troubleshooting the CM-1480 colour display monitor. Enough information is included to assist in diagnosing most faults to the major component level.

5-1 ORGANIZATION

General troubleshooting information is included in the each paragraph of this section. Read these paragraphs before proceeding. They contain safety guidelines, tests and diagnostics, and other important information.

Following this general information is a series of troubleshooting flowcharts. These charts are designed to assist in diagnosing faults to the major component level. Always begin with the General Troubleshooting Chart. This chart will direct you to an adjustment or to a more detailed chart.

5-2 SAFETY GUIDELINES

Read the following safety notes carefully before attempting to troubleshoot or repair this monitor.

WARNING: The anode of the CRT retains a potentially lethal voltage when the monitor is turned off. Perform repairs only after the CRT has been properly discharged. Refer to Fig 5-1 and the following procedure to discharge the CRT anode:

(1) Connect a clip lead or heavy gauge wire to chassis ground.

(2) Connect the other end of the lead to the stem of a flat blade screwdriver that has an insulated handle.

(3) Insert the blade of the screwdriver under the rubber insulation that covers the anode lead on the CRT and make contact with the anode terminal. Depending on the quantity of charge present on the anode, a distinct snap may be heard as the CRT discharges. Allow approx 3 seconds for the CRT to discharge completely.

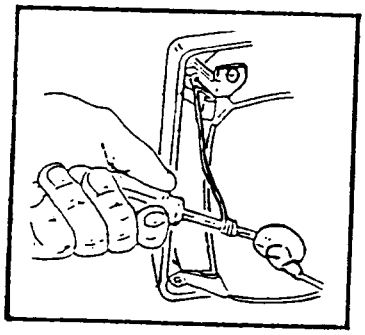
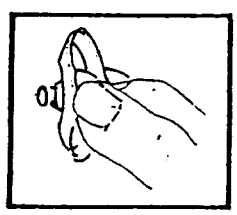


Fig 5-1 CAREFULLY SLIDE A GROUNDED FLAT SCREWDRIVER TIP UNDER THE LIP OF THE ANODE LEAD.



AFTER DISCHARGING THE VOLTAGE DISCONNECT THE ANODE LEAD FROM THE CRT.

WARNING: Operation of the CRT at voltages higher than 25kV may produce X-rays. Always verify that the anode voltage is at normal level when servicing the monitor. Do not operate the monitor with excessively high voltage any longer than is necessary to locate the cause of the excessive voltage.

WARNING: The switch mode power supply contains circuits that generate dangerous high-frequency, high amplitude signals that present a potentially lethal shock hazard. Do not attempt to troubleshoot the power supply. If the power supply requires service, return it to the manufacturer.

WARNING: Parts of the power supply circuitry are not isolated. To prevent both personal injury and equipment damage, an isolation transformer must be used while troubleshooting this monitor.

CAUTION: All components should be replaced only with types identical to those in the original circuit, and their physical location, wiring and lead dress must conform to the original layout upon completion of repairs.

5-3 AC LEAKAGE TEST

The repair and reassembly of the monitor can inadvertently cause a loss of electrical isolation between the AC power wires and the exposed metal parts of the monitor. If this isolation is lost or significantly reduced, electrical shock can result.

Carry out the AC leakage current tests delailed in chapter 2, paragraph 2-1 to verify the safety of the equipment.

5-4 SUGGESTED TOOLS AND EQUIPMENT

The following tools and supplies are recommended for servicing the monitor.

* Flat-blade screwdriver, 6mm blade
* Philips screwdrivers, No. 1 and No. 2 tips
* Plastic alignments tools.
* Diagonal cutters
* Wire strippers
* Long nose pliers
* Soldering iron, 25 to 40 watt
* Solder, 60/40 (HE-490-185)
* Desoldering braid (HE-354-59)

The following equipment is recommended for troubleshooting the monitor as described in this chapter:

* PC-AT computer or equivalent
* CGA and EGA video cards
* Oscilloscope: DC to 100MHz, dual trace triggered sweep.
* Oscilloscope probe: low capacitance, 4 ns rise time.
* Digital voltmeter: high impedance input, zero to 1000 volts, zero to 1 megohm.
* High-voltage probe: zero to 40kV.
* 10x magnifying glass (or better)
* Isolation transformer

5-5 INSPECTION AND PREPARATION

Before turning the monitor on, inspect the power lead, video cable, and all connectors for damaged insulation or loose pins.
Inspect the exterior of the monitor for signs of damage. If physical damage is evident, remove the cabinet back and inspect further before proceeding.
If these preliminary checks do not indicate a problem, proceed as follows:

(1) Connect the video cable from the monitor to the computer.
(2) Insert Tatung test floppy disc.
(3) Turn computer and monitor on. Observe display for faults and refer to the troubleshooting section only after reading the remaining procedures in this section.
(4) Allow the monitor to warm up for approximately 30 minutes, unless a fault diagnosed in (3) prevents this.

5-6 COLOUR BAR TEST

1. Press F1 or F2.
2. Press shift 6
3. Colour bars should now be displayed.

Use this test in conjunction with the troubleshooting charts which follow this section.

5-7 WHITE FIELD

(1) Press F1 or F2
(2) Press F4 or F5, F6, F7, F8.

5-8 TROUBLESHOOTING CHARTS

This section contains a series of troublshooting charts designed to assist in diagnosing faults to the major component level. Always begin with the General Troubleshooting Chart. This chart will then direct you to check a particular item, perform an adjustment or consult a more detailed chart. The charts are:
General Troubleshooting Chart (Fig 5-2)
Power Supply Troubleshooting Chart (Fig 5-3)
Video Board Troubleshooting Chart (Fig 5-4)
CRT Board Troubleshooting Chart (Fig 5-5)
Main Board Troubleshooting Chart (Fig 5-6)

NOTE: Always refer to the appropriate schematic as you work through the steps of a troubleshooting chart. These charts are designed to assist in diagnosing faults, but they connot substitute for the information contained in the schematics.

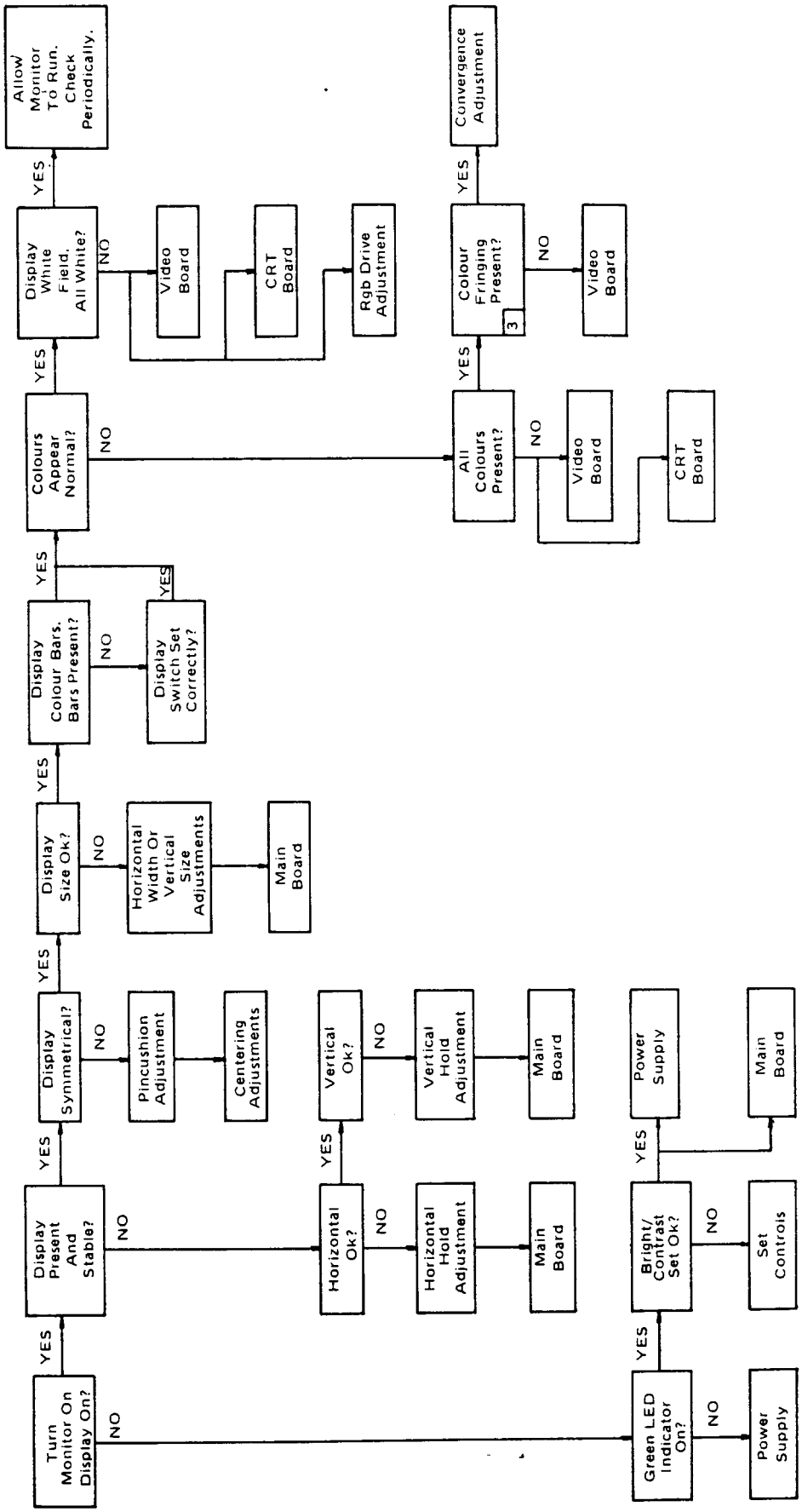


Fig 5-2 General Troubleshooting Chart

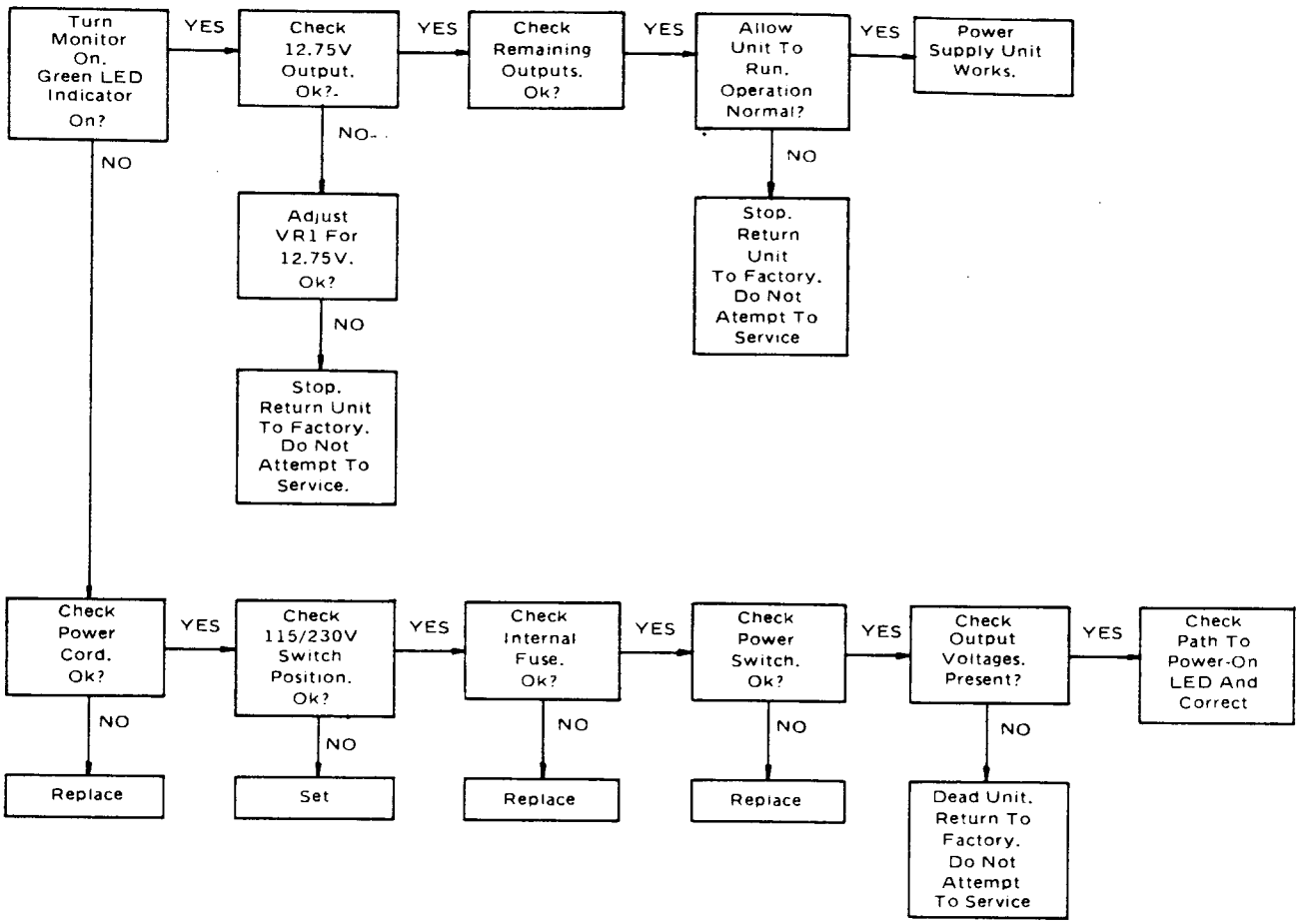


Fig 5-3 Power Supply Troubleshooting Chart

Notes

1. R813 may be accessed through a hole labeled B-ADJ in the side of the power supply enclosure.
2. The video board must be removed to access the internal fuse. The fuse is located below and to the left of R813.

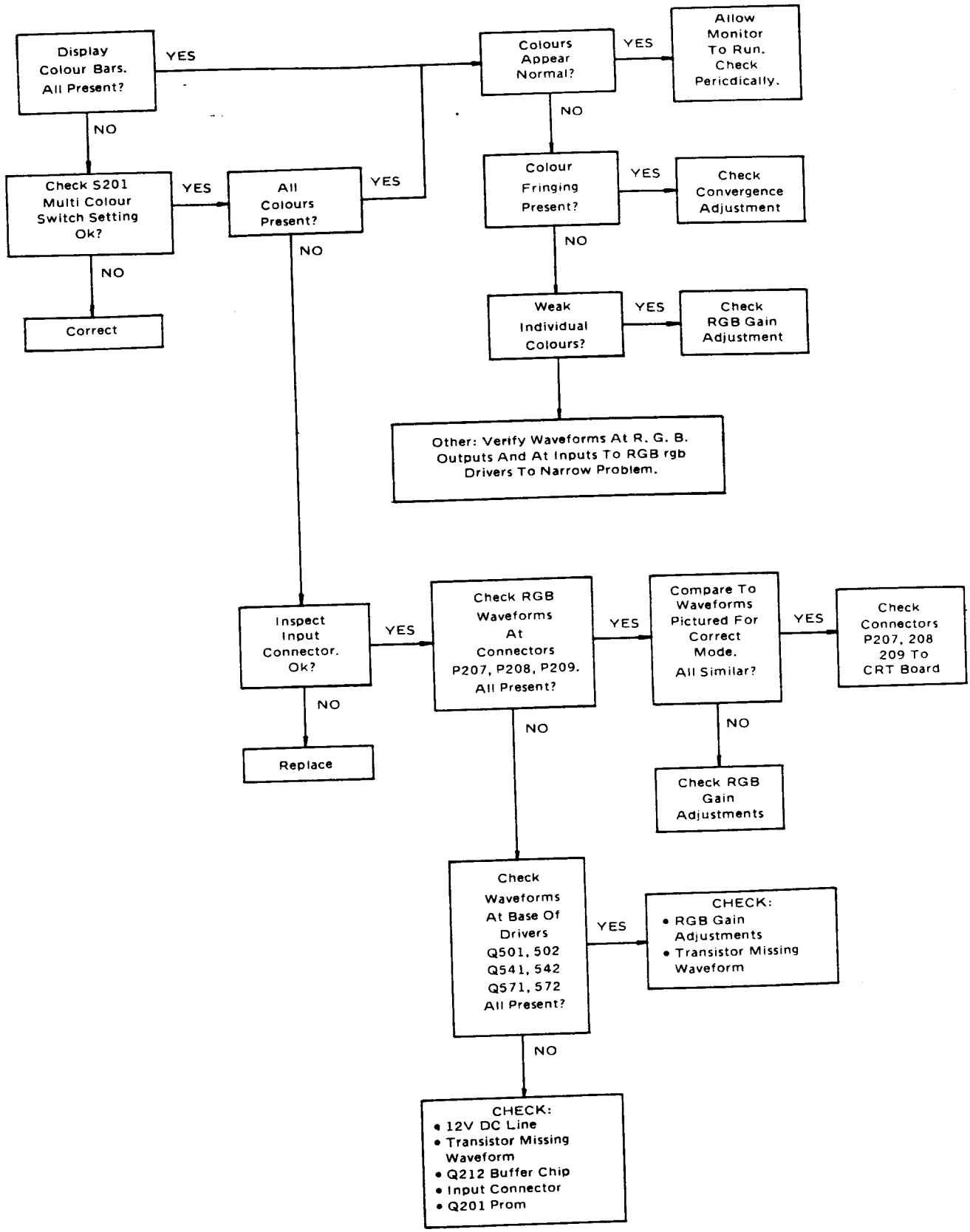


Fig 5-4 Video Board Troubleshooting Chart

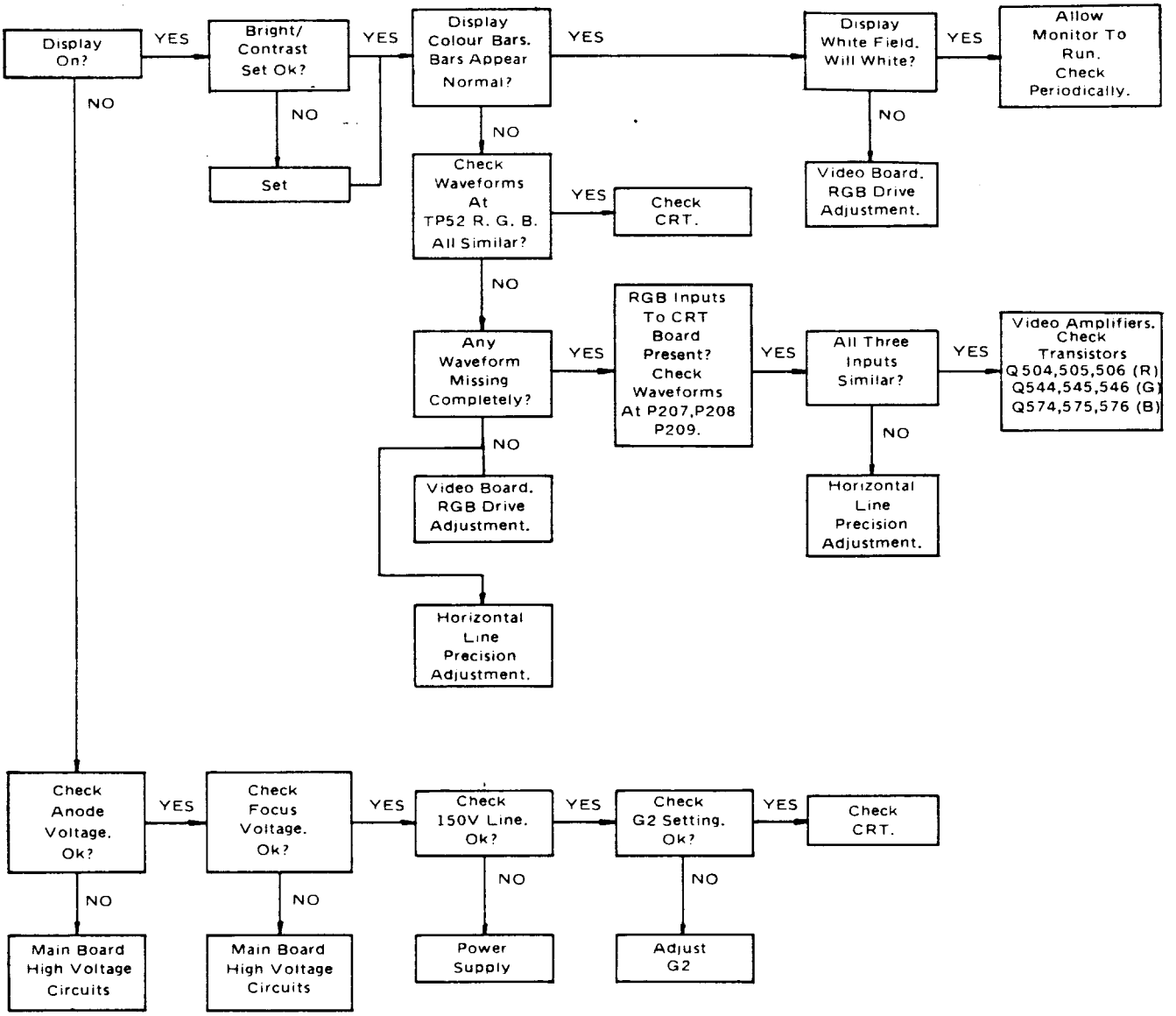


Fig 5-5 CRT Board Troubleshooting Chart

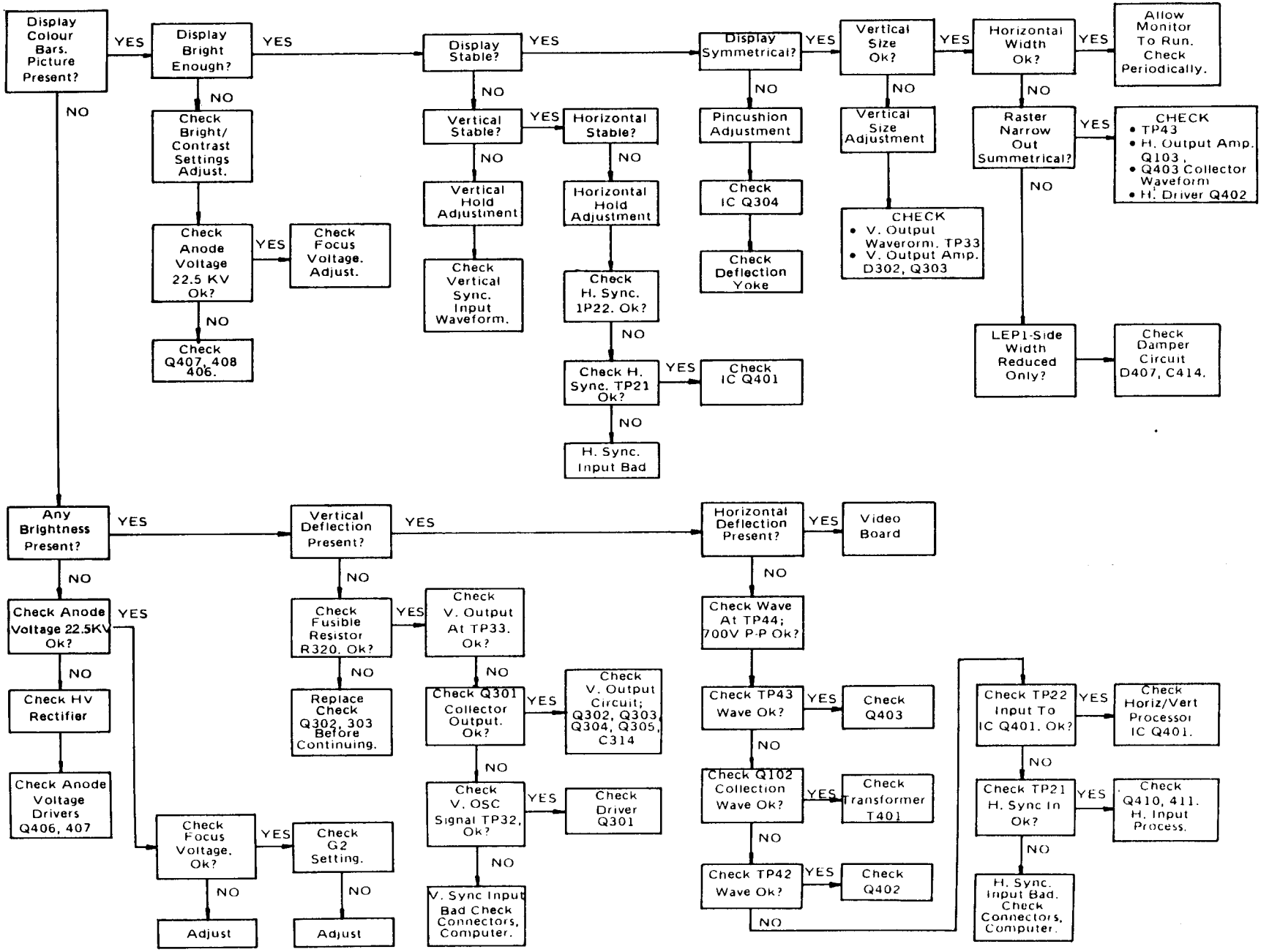


Fig 5-6 Main Board Troubleshooting Chart

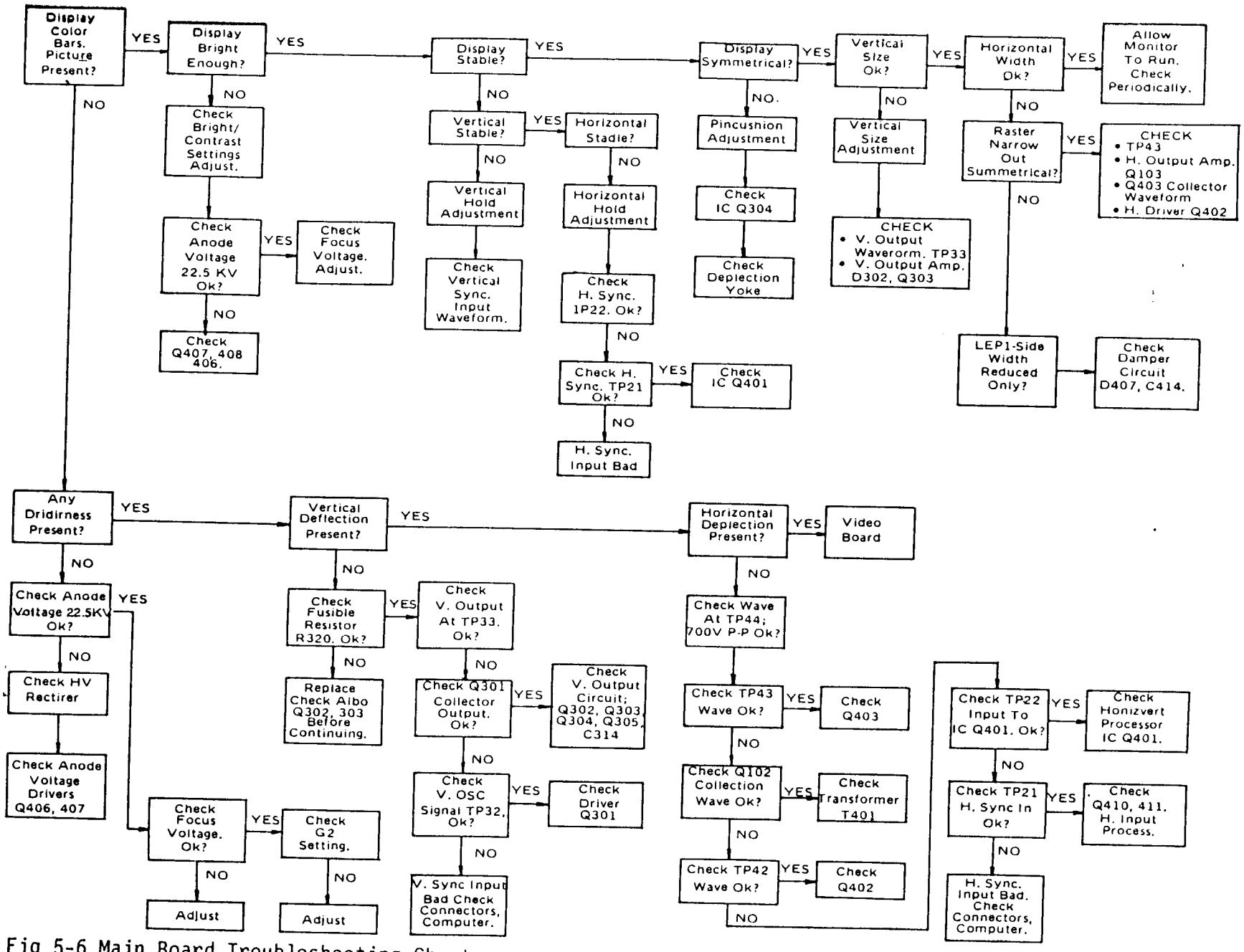


Fig 5-6 Main Board Troubleshooting Chart

CHAPTER 6

P.C.B LAYOUTS

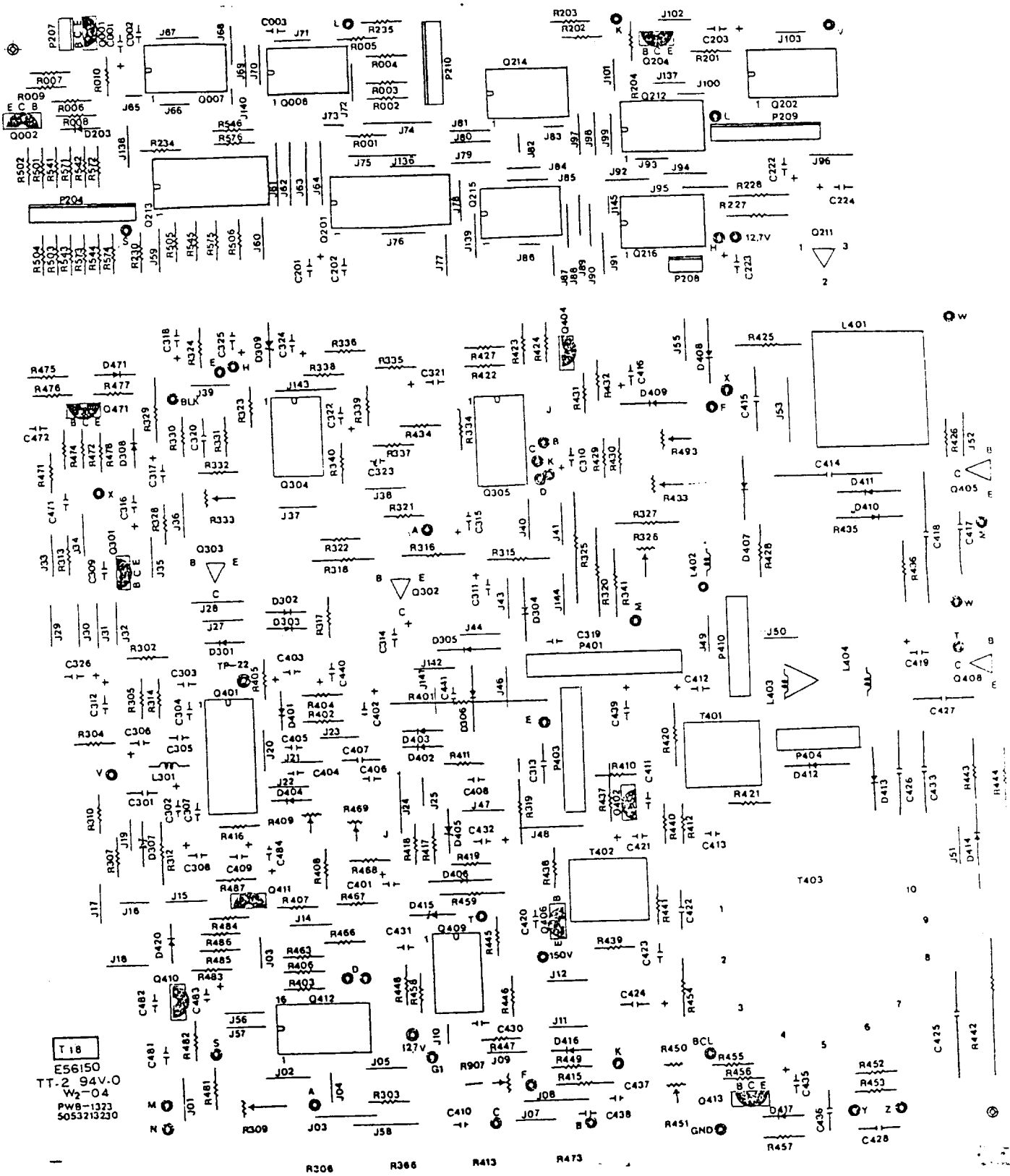


Fig 6-1 PCB-MAIN COMPONENTS LAYOUT

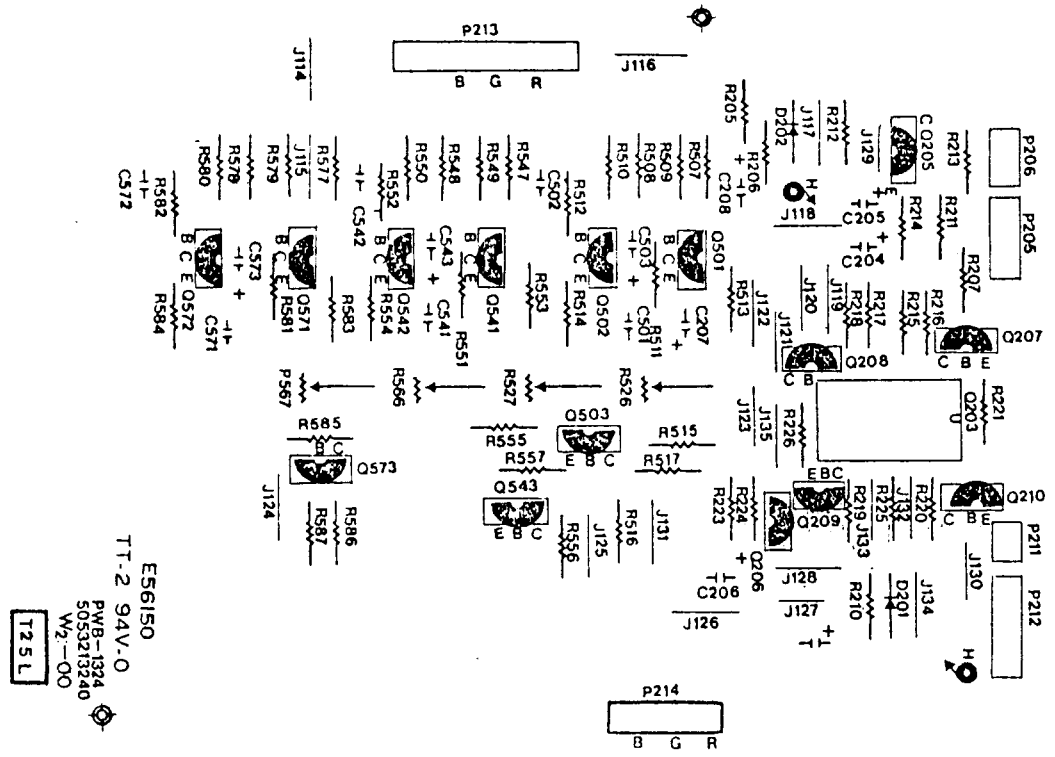


Fig 6-2 PCB-VIDEO DRIVE COMPONENTS LAYOUT

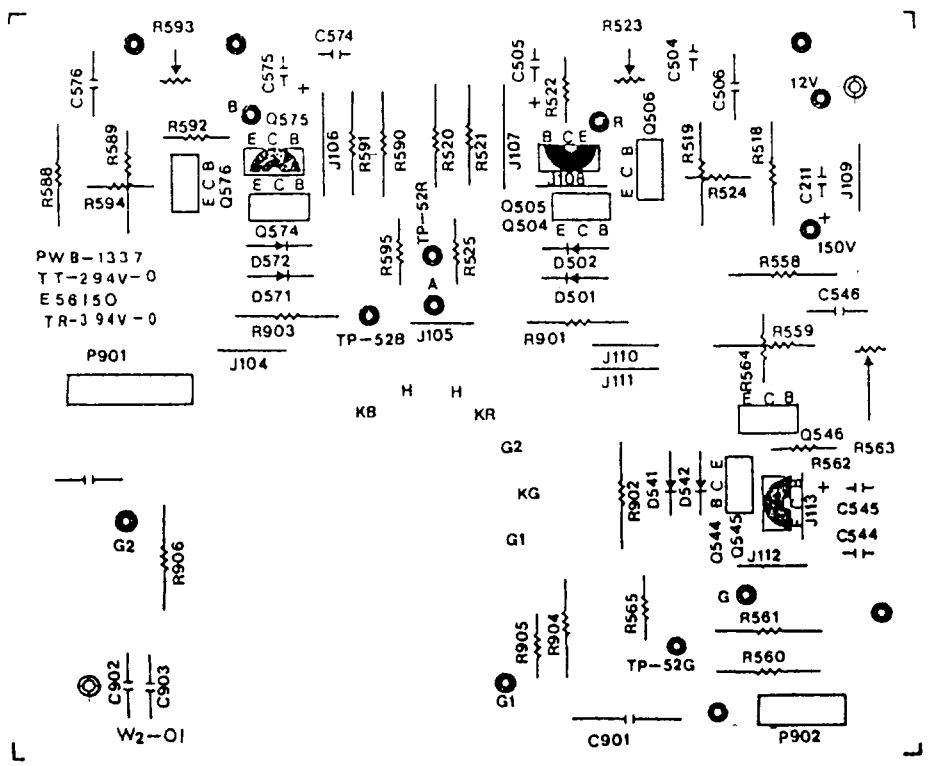


Fig 6-3 PCB-CRT DRIVE COMPONENTS LAYOUT

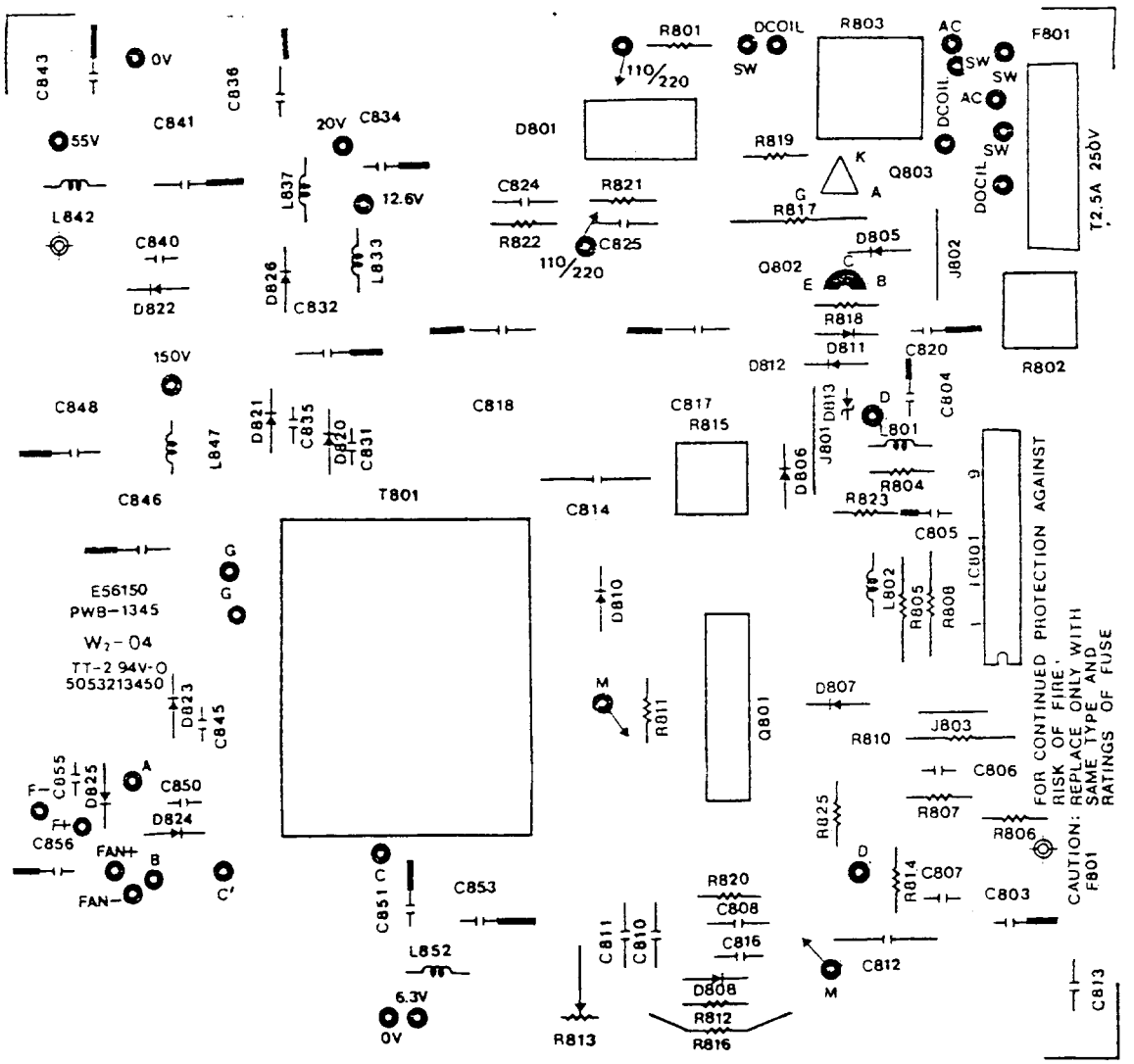


Fig 6-4 PCB-POWER COMPONENTS LAYOUT

CHAPTER 8

REPLACEMENT PARTS LIST

WARNING: Replacement parts which have special characteristics important to safety should be replaced only with types identical to those in the original circuit or specified in the parts list. Before replacing any of these components, read carefully the product safety precaution, do not degrade the safety of the display through improper servicing.

AEBREVIATIONS:

CAPACITORS.....	CD: Ceramic Disc	PF: Plastic Film
	EL: Electrolytic	TA: Tantalum
RESISTORS.....	CF: Carbon Film	VR: Variable Resistor
	CC: Carbon Composition	FU: Fusible
	MOF: Metal Oxide Film	MF: Metal Film

CIRCUIT REF.	PART NUMBER	DESCRIPTION
8-1 ASSEMBLY, AS/WS		
SEMICONDUCTORS		
Q403	6622013400	TR, NPN LF 2SD1094
Q405	6624006201	TR, PNP LF 2SB856
Q407	6621015003	TR, NPN BU208
Q408	6621025900	TR, NPN 2SC2898
8-2 ASSEMBLY, CONTROL		
RESISTORS		
R208, 209	5161161914	VR, 10k
ASSEMBLY, PCB-MAIN PWB-1323-02		
CAPACITOR		
C001	5213322091	EL, 16V 22u
C002, 003	5231810391	CD, 50V 10n, Z5U
C201	5213310191	EL, 16V 100u
C202	5231810391	CD, 50V 10n
C203	5213210191	EL, 10V 100u
C222	5213310191	EL, 16V 100u
C223	5213347112	EL, 16V 470u
C224	5213310191	EL, 16V 100u
C301	5222233391	CD, 50V 33n, 10% Z5U
C302	5213601091	EL, 50V 1u0
C303	5247010191	CD, 50V 100p 5%, NPO
C304	5231368191	CD, 50V 680p 10%, NPO
C305	5247015191	CD, 50V 150p 5%, NPO
C306	5210202691	TA, 35V 1.5u, 10%
C307	5231347291	CD, 50V 4n7, 10%
C308	5213333112	EL, 16V 330u
C309	5232318191	CD, 500V 180p 10%, NPO
C310	5213610112	EL, 50V 100u
C311	5213510091	EL, 35V 10u
C312	5210401391	EL, 16V 10u, 10%
C313	5223433301	POLYPROPYLENE, 250V 27n+/-10%
C314	5213000901	EL, 160V 4.7u
C315	5213622112	EL, 50V 220u

CIRCUIT REF.		PART NUMBER	DESCRIPTION
C316		5214233991	EL, 160V 3.3u
C317		5213647991	EL, 50V 4.7u
C318		5213510091	EL, 35V 10u
C319		5232747291	CD, 500V 4n7
C320		5271147301	POLYESTER, 100V 47n, 5%
C321		5213647991	EL, 50V 4u7
C322		5213647012	EL, 50V 47u
C323		5231847291	CD, 50V 4n7
C324		5213510091	EL, 35V 10u
C325		5213310191	EL, 16V 100u
C326		5210400391	EL, 50V 2u2
C401		5213347091	EL, 16V 47u
C402		5213601091	EL, 50V 1u0
C403		5213322091	EL, 16V 22u
C404		5221268291	POLYESTER, 50V 6n8, 10%
C405		5221215391	POLYESTER, 50V 15n, 10%
C406		5221110291	POLYESTER, 50V 1n0, 5%
C407		5223647201	POLYPROPYLENE, 630V 4n7 5%
C408		5221127291	POLYESTER, 50V 2n7, 5%
C409		5213347091	EL, 16V 47u
C410		5221168291	POLYESTER, 50V 6n8, 5%
C411		5247010191	CD, 50V 100p 5%
C412		5213601091	EL, 50V 1u0
C413		5231847291	CD, 50V 4n7
C414	RA	5223795201	POLYPROPYLENE, 1600V 9n5, 5%
C414	RB	5223295202	POLYPROPYLENE, 1600V 9n5, 5%
C415		5223410401	POLYPROPYLENE, 250V 0u1
C416		5214122012	EL, 100V 22u
C417		5271110501	POLYESTER, 100V 1u0, 5%
C418		5272127501	MF, 250V 2u7, 5%
C419		5214210012	EL, 160V 10u
C420		5247010191	CD, 50V 100p 5%
C421		5213601091	EL, 50V 1u0
C422		5224422301	POLYPROPYLENE, 250V 22n, 10%
C423		5231847291	CD, 50V 4n7
C424		5216347001	EL, 200V 47u
C425		5272122501	POLYESTER, 250V 2u2
C426	RA	5223722201	POLYPROPYLENE, 1600V 2n2, 5%
C426	RB	5223222201	POLYPROPYLENE, 1600V 2n2, 5%
C427		5271147401	POLYESTER, 100V 0u47, 5%
C428		5232710301	CD, 500V 10n,
C430		5231322291	CD, 50V 2n2, 10%
C431		5221410401	POLYESTER, 100V 0u1, 5%
C432		5213622091	EL, 50V 22u
C433	RA	5223733201	POLYPROPYLENE, 1600V 3n3, 5%
C433	RB	5223233201	POLYPROPYLENE, 1600V 3n3, 5%
C435		5213547091	EL, 35V 47u
C436		5221122401	POLYESTER, 50V 0u22, 5%
C437		5222147291	POLYESTER, 50V 4n7, 5%
C438		5221127291	POLYESTER, 50V 2n7, 5%
C439		5213722110	EL, 63V 220u, 5%

CIRCUIT REF.	PART NUMBER	DESCRIPTION
C471	5221147291	POLYESTER, 50V 4n7, 5%
C472	5221122391	POLYESTER, 50V 22n, 5%
C481	5231333191	CD, 50V 330p, 10%
C482	5247082091	CD, 50V 82p, 5%
C483, 484	5213601091	EL, 50V 1u0
RESISTORS		
R001	5142830195	CF, 1/4W 300 R
R002 - R005	5142833295	CF, 1/4W 3k3
R006	5142839195	CF, 1/4W 390 R
R007	5142833295	CF, 1/4W 3k3
R008	5142839195	CF, 1/4W 390 R
R009	5142833295	CF, 1/4W 3k3
R010	5142891195	CF, 1/4W 910 R
R201	5142833195	CF, 1/4W 330 R
R202, 203	5142810395	CF, 1/4W 10k
R204	5142822395	CF, 1/4W 22k
R227, 228	5142433090	CF, 1/2W 33 R
R230	5142812295	CF, 1/4W 1k2
R234	5142810195	CF, 1/4W 100 R
R235	5142822195	CF, 1/4W 220 R
R302	5142847195	CF, 1/4W 470 R
R303	5142827195	CF, 1/4W 270 R
R304	5142820295	CF, 1/4W 2k0
R305	5142815395	CF, 1/4W 15k
R306	5160806110	VR, 1k0
R307	5142810395	CF, 1/4W 10k
R309	5162171720	VR, 5k0
R310	5142827395	CF, 1/4W 27k
R312	5142412190	CF, 1/2W 120 R
R313	5142811395	CF, 1/4W 11k
R314	5142891295	CF, 1/4W 9k1
R315, R316	5130212204	MOF, 1/2W 1k2
R317	5142875095	CF, 1/4W 75 R
R318	5130215904	MF, 1/2W 1R5
R319	5130310004	MOF, 1W 10 R
R320	5133222907	FU, 1W 2R2
R321	5142802095	CF, 1/4W 2R0
R322	5142847995	CF, 1/4W 4R7
R323	5142833395	CF, 1/4W 33k
R324	5142810395	CF, 1/4W 10k
R325	5130412104	MOF, 2W 120 R
R326	5162171920	VR, 10k
R327	5142410290	CF, 1/2W 1k0
R328	5142868295	CF, 1/4W 6k8
R329	5142412290	CF, 1/2W 1k2
R330	5142810495	CF, 1/4W 100k
R331	5142810595	CF, 1/4W 1M0
R332	5142810395	CF, 1/4W 10k
R333	5162171920	VR, 10k
R334	5142810295	CF, 1/4W 1k0
R335, R336	5142810495	CF, 1/4W 100k
R337	5142810595	CF, 1/4W 1M0
R338	5142882195	CF, 1/4W 820R
R339	5142810395	CF, 1/4W 10k
R340	5142882395	CF, 1/4W 82k
R341	5142410290	CF, 1/2W 1k0
R366	5160806110	VR, 1k0

CIRCUIT REF.	PART NUMBER	DESCRIPTION
R401	5136524200	MOF, 3W 2k4
R402	5142868295	CF, 1/4W 6k8
R403	5142868395	CF, 1/4W 68k
R404	5142868295	CF, 1/4W 6k8
R405, R406, R407	5142856295	CF, 1/4W 5k6
R408	5142824295	CF, 1/4W 2k4
R409	5162171710	VR, 5k0
R410	5142847195	CF, 1/4W 470 R
R411	5142822395	CF, 1/4W 22k
R412	5142810295	CF, 1/4W 1k0
R413	5160806119	VR, 10k
R415	5142415290	CF, 1/2W 1k5
R416	5142847295	CF, 1/4W 4k7
R417, R418	5142810295	CF, 1/4W 1k0
R419	5142815295	CF, 1/4W 1K5
R420	5130427103	MOF, 2W 270 R
R421	5142810195	CF, 1/4W 100 R
R422, R423	5142822295	CF, 1/4W 2k2
R424	5142833195	CF, 1/4W 330 R
R425	5142422190	CF, 1/2W 220 R
R426	5142810195	CF, 1/4W 100 R
R427	5142856395	CF, 1/4W 56k
R428	5130351107	MOF, 1W 510 R
R429	5142810495	CF, 1/4W 100k
R430	5142833295	CF, 1/4W 3k3
R431	5142810495	CF, 1/4W 100k
R432	5142810295	CF, 1/4W 1k0
R433	5162171720	VR, 5k0
R434	5142810295	CF, 1/4W 1k0
R435	5162901402	VR, 3W 60 R
R436	5130456003	MOF, 2W 56 R
R437	5130427103	MOF, 2W 270 R
R438	5142810295	CF, 1/4W 1k0
R439, R440	5142818195	CF, 1/4W 180 R
R441	5142827095	CF, 1/4W 27 R
R442, R443	5130718200	MOF, 5W 1k8
R444	5130310007	MOF, 1W 10 R
R445	5142847195	CF, 1/4W 470 R
R446	5142856395	CF, 1/4W 56k
R447, R448	5142810295	CF, 1/4W 1k0
R449	5142810395	CF, 1/4W 10k
R450	5145839390	CF, 1/4W 39k
R451	5162172210	VR, 22k
R452, R453	5142820295	CF, 1/4W 2k0
R454	5133122907	FU, 1/2W 2R2
R455	5142847495	CF, 1/4W 470k
R456	5142810195	CF, 1/4W 100 R
R457	5142810395	CF, 1/4W 10k
R458	5142822195	CF, 1/4W 220 R
R459	5130322207	MOF, 1W 2k2
R463	5142827395	CF, 1/4W 27k
R466	5142843295	CF, 1/4W 4k3
R467	5142830295	CF, 1/4W 3k0
R468	5142824295	CF, 1/4W 2k4
R469	5162171710	VR, 5k0
R471	5142847195	CF, 1/4W 470 R
R472	5142811195	CF, 1/4W 110 R
R473	5160806119	VR, 10k

CIRCUIT REF.	PART NUMBER	DESCRIPTION
R474	5142868395	CF, 1/4W 68k
R475, R476	5142810295	CF, 1/4W 1k0
R478	5142810395	CF, 1/4W 10k
R481	5142810295	CF, 1/4W 1k0
R482	5142810195	CF, 1/4W 100 R
R483	5142839395	CF, 1/4W 39k
R484	5142845395	CF, 1/4W 15k
R485	5142810295	CF, 1/4W 1k0
R486	5142868495	CF, 1/4W 680k
R487	5142856295	CF, 1/4W 5k6
R493	5162171720	VR, 5k0
R501, R502	5142868195	CF, 1/4W 680 R
R503, R504	5142812295	CF, 1/4W 1k2
R505, R506	5142810195	CF, 1/4W 100 R
R541, R542	5142868195	CF, 1/4W 680 R
R543, R544	5142812295	CF, 1/4W 1k2
R545, R546	5142810195	CF, 1/4W 100 R
R571, R572	5142868195	CF, 1/4W 680 R
R573, R574	5142812295	CF, 1/4W 1k2
R575, R576	5142810195	CF, 1/4W 100 R
R907	5162171920	VR, 10k
SEMICONDUCTIORS		
D203, D301, D302, D303	6613001760	DIODE, SWITCHING 1S2076
D304, D305 RA	6613002233	DIODE, SWITCHING V09C
D304, D305 RB	6613002234	DIODE, SWITCHING RGP10D
D306 RA	6611013231	DIODE, RECTIFIER V06E
D306 RB	6611013233	DIODE, RECTIFIER GP15G
D307	6615007930	DIODE, ZENER HZ11A-2
D308	6613001760	DIODE, SWITCHING 1S2076
D309 RA	6615009711	DIODE, ZENER HZ6C-2LTE
D309 RB	6615006431	DIODE, ZENER E0A01-065B
D401 - D404	6613001760	DIODE, SWITCHING 1S2076
D405	6615005800	DIODE, ZENER HZ12A1
D406, D408 - D412, D414 RA	6611017600	DIODE, RECTIFIER V19E
D406, D408 - D412, D414 RB	6611017400	DIODE, RECTIFIER RGP10G
D407, D413	6611013031	DIODE, RECTIFIER RGP15M
D415 RA	6615009703	DIODE, ZENER HZ5C-2TE
D415 RB	6615007831	DIODE, ZENER 05Z5.1X
D416, D417, D420	6613001760	DIODE, SWITCHING 1S2076
D471	6613001760	DIODE, SWITCHING 1S2076
Q001, Q002	6621015302	TR, NPN 2SC1815Y
Q007, Q008 RA	6646006717	IC, DM74LS74
Q007, Q008 RB	6646006708	IC, HD74LS74AP
Q201 RA	6647028100	IC, TBP28S42N
Q201 RB	6646043000	IC, 74S472N
Q202	6646009922	IC, HD74LS86
Q204	6621003200	TR, NPN 2SC458C
Q211 RA	6640000410	IC, HA17805P
Q211 RB	6640001400	IC
Q211 RC	6640001900	IC, AN7805
Q212 RA	6646008000	IC, HD74S05P
Q212 RB	6646008213	IC, SN74LS05N
Q213	6646012713	IC, 74LS244P
Q214, Q215	6646009922	IC, HD74LS86
Q216	6646009400	IC, HD74LS11P
Q301	6621013800	TR, NPN 2SC1921
Q302	6622007400	TR, NPN 2SD1138C

CIRCUIT REF.	PART NUMBER	DESCRIPTION
Q303	6624007400	TR, PNP 2SB861C
Q304 RA	6644042900	IC, HA17324
Q304 RB	6644006703	IC, LM324N
Q305 RA	6645009002	IC, HD14053BP
Q305 RB	6645009001	IC, HEF4053BP
Q401	6644012400	IC, HA11235
Q402, Q404, Q406	6622013300	TR, NPN 2SD667C
Q409 RA	6644042900	IC, HA17324
Q409 RB	6644006703	IC, LM324N
Q410	6621003200	TR, NPN 2SC458C
Q411	6623001102	TR, PNP 2SA844E
Q412 RA	6645009002	IC, HD14053BP
Q412 RB	6645009001	IC, HEF4053BP
Q413, Q471	6621003200	TR, NPN 2SC458C
TRANSFORMERS		
T401	5062412501	TLN-125A
T402	5062412501	TLN-125A
⚠T403	5062617610	TFB-176G 300M R

8-3 ASSEMBLY, PCB-VIDEO PWB-1324-02

CAPACITORS		
C204, C205	5213447091	EL, 25V 47u
C206	5213510091	EL, 35V 10u
C207, C208	5213522091	EL, 35V 22u
C501, C502	5231810391	CD, 50V 10n, Z5U
C503	5213510091	EL, 35V 10u
C541, C542	5231810391	CD, 50V 10n, Z5U
C543	5213510091	EL, 35V 10u
C571, C572	5231810391	CD, 50V 10n, Z5U
C573	5213510091	EL, 35V 10u
RESISTORS		
R205	5142812295	CF, 1/4W 1k2
R206	5142833295	CF, 1/4W 3k3
R207	5142856295	CF, 1/4W 5k6
R210	5142856395	CF, 1/4W 56k
R211	5142833095	CF, 1/4W 33 R
R212	5142810395	CF, 1/4W 10k
R213	5142856295	CF, 1/4W 5k6
R214	5142833095	CF, 1/4W 33 R
R215 - R220	5142822295	CF, 1/4W 2k2
R221	5142833095	CF, 1/4W 33 R
R223	5131782008	MF, 1/4W 820 R
R224	5131715018	MF, 1/4W 1k5
R225	5142810295	CF, 1/4W 1k0
R226	5142815295	CF, 1/4W 1k5
R507, R508	5142847195	CF, 1/4W 470 R
R509, R510	5142815295	CF, 1/4W 1k5
R511, R512	5136147195	MF, 1/4W 470 R
R513, R514	5131710018	MF, 1/4W 1k0
R515	5142856195	CF, 1/4W 560 R
R516	5142833295	CF, 1/4W 3k3
R517	5142882195	CF, 1/4W 820 R
R526, R527	5162907602	VR, 2k0
R547, R548	5142847195	CF, 1/4W 470 R
R549, R550	5142815295	CF, 1/4W 1k5

CIRCUIT REF.	PART NUMBER	DESCRIPTION
R551, R552	5136147195	MF, 1/4W 470 R
R553, R554	5131710018	MF, 1/4W 1k0
R555	5142856195	CF, 1/4W 560 R
R556	5142833295	CF, 1/4W 3k3
R557	5142882195	CF, 1/4W 820 R
R566, R567	5162907602	VR, 2k0
R577, R578	5142847195	CF, 1/4W 470 R
R579, R580	5142815295	CF, 1/4W 1k5
R581, R582	5131747508	MF, 1/4W 475 R
R583, R584	5131717818	MF, 1/4W 1k78
R585	5142856195	CF, 1/4W 560 R
R586	5142833295	CF, 1/4W 3k3
R587	5142882195	CF, 1/4W 820 R
SEMICONDUCTIORS		
D201, D202	6613001760	DIODE, SWITCHING 1S2076
Q203 RA	6644042900	IC, 17324
Q203 RB	6644006703	IC, LM324N
Q205 RA	6624005104	TR, PN BC307B KEC
Q205 RB	6624005102	TR, PNP BC307B
Q206, Q207, Q208	6622002901	TR, NPN BC237B
Q209 RA	6624005104	TR, PNP BC307B KEC
Q209 RB	6624005102	TR, PNP BC307B
Q210 RA	6624005104	TR, PNP BC307B KEC
Q210 RB	6624005102	TR, PNP BC307B
Q501 AA	6621004500	TR, NPN 2N2369
Q501 BA	6621026300	TR, NPN 2SC641K
Q502 AB	6621004500	TR, NPN 2N2369
Q502 BB	6621026300	TR, NPN 2SC641K
Q503	6622002901	TR, NPN BC237B
Q541 AF	6621004500	TR, NPN 2N2369
Q541 BF	6621026300	TR, NPN 2SC641K
Q542 AG	6621004500	TR, NPN 2N2369
Q542 BG	6621026300	TR, NPN 2SCC641K
Q543	6622002901	TR, NPN BC237B
Q571 AN	6621004500	TR, NPN 2N2369
Q571 BN	6621026300	TR, NPN 2SC641K
Q572 AO	6621004500	TR, NPN 2N2369
Q572 BO	6621026300	TR, NPN 2SC641K
Q573	6622002901	TR, NPN BC237B

8-4 ASSEMBLY, PCB-CRT DRIVE PWB-1337-02

CAPACITORS		
C211	5214422912	EL, 250V 2u2
C504	5222222391	POLYESTER, 50V 22n, 10%
C505	5213522091	EL, 35V 22u
C506	5223433301	POLYPROPYLENE, 250V 33n, 5%
C544	5222222391	POLYESTER, 50V 22n, 10%
C545	5213522091	EL, 35V 22u
C546	5223433301	POLYPROPYLENE, 250V 33n, 5%
C574	5222222391	POLYESTER, 50V 22n, 10%
C575	5213522091	EL, 35V 22u
C576	5223433301	POLYPROPYLENE, 250V 33n, 5%
C901	5223622301	POLYPROPYLENE, 630V 22n, 5%
C902, C903	5232000701	CD, 2kV 4n7, 20%

CIRCUIT REF.	PART NUMBER	DESCRIPTION
RESISTORS		
R518, R519	5130427203	MOF, 2W 2k7
R520, R521	5130468203	MOF, 2W 6k8
R522	5142833195	CF, 1/4W 330 R
R523	5162170810	VR, 500 R
R524	5142810195	CF, 1/4W 100 R
R525	5142868095	CF, 1/4W 68 R
R558, R559	5130427203	MOF, 2W 2k7
R560, R561	5130468203	MOF, 2W 6k8
R562	5142833195	CF, 1/4W 330 R
R563	5162907600	VR, 500 R
R564	5142810195	CF, 1/4W 100 R
R565	5142868095	CF, 1/4W 68 R
R588, R589	5130427203	MOF, 2W 2k7
R590, R591	5130468203	MOF, 2W 6k8
R592	5142833195	CF, 1/4W 330 R
R593	5162170810	VR, 500 R
R594	5142810195	CF, 1/4W 100 R
R595	5142868095	CF, 1/4W 68 R
R901, R902, R903	5111233190	CC, 1/2W 330 R
R904	5111210290	CC, 1/2W 1k0
R905	5142815495	CF, 1/4W 150k
R906 RA	5111282490	CC, 1/2W 820k
R906 RB	5142482490	CF, 1/2W 820k
SEMICONDUCTIORS		
D501, D502, D541, D542, D571, D572	6613001730	DIODE, SWITCHING 1S2076
Q504 AC	6621026000	TR, NPN 2SC1507
Q504 BC	6621013700	TR, NPN 2SC1514
Q505 AD	6621004500	TR, NPN 2N2369
Q505 BD	6621014530	TR, NPN 2SC1906
Q506 AE	6621026000	TR, NPN 2SC1507
Q506 BE	6621013700	TR, NPN 2SC1514
Q544 AH	6621026000	TR, NPN 2SC1507
Q544 BH	6621013700	TR, NPN 2SC1514
Q545 AI	6621004500	TR, NPN 2N269
Q545 BI	6621014530	TR, NPN 2SC1906
Q546 AJ	6621026000	TR, NPN 2SC1507
Q546 BJ	6621013700	TR, NPN 2SC1514
Q574 AK	6621026000	TR, NPN 2SC1507
Q574 BK	6621013700	TR, NPN 2SC1514
Q575 AL	6621004500	TR, NPN 2N2369
Q575 BL	6621014530	TR, NPN 2SC1906
Q576 AM	6621026000	TR, NPN 2SC1507
Q576 BM	6621013700	TR, NPN 2SC1514

8-5 ASSEMBLY, PCB-POWER PWB-1345-02

CAPACITORS		
C803	5215310101	EL, 16V 100u
C804	5215347101	EL, 16V 470u
C805	5215310101	EL, 16V 100u
C806	5247033001	CD, 50V 33p
C807	5231322201	CD, 50V 2n2, 10%
C808	5221110391	POLYESTER, 50V 10n, 5%
C810	5271115401	POLYESTER, 100V 0u15, 5%
C811	5272110401	POLYESTER, 250V 0u1, 5%

CIRCUIT REF.	PART NUMBER	DESCRIPTION
C812	5223715200	POLYPROPYLENE, 1600V 1n5, 5%
C813	5221110391	POLYESTER, 50V 10n, 5%
C814	5223647301	POLYPROPYLENE, 630V 47n 5%
C816	5221110391	POLYESTER, 50V 10n, 5%
C817, C818	5210601001	EL, 250V 220u, 20%
C820	5215310101	EL, 16V 100u
C824, C825	5232347291	CD, 500V 4n7, 10%
C831	5232333101	CD, 500V 330p, 10%
C832	5210403501	EL, 35V 1000u
C835	5232333101	CD, 500V 330p, 10%
C836	5215410201	EL, 25V 1000u
C840	5232310201	CD, 500V 1n0, 10%
C841	5216122101	EL, 100V 220u
C845	5232310201	CD, 500V 1n0, 10%
C846	5216347001	EL, 200V 47u
C850	5232333101	CD, 500V 330p, 10%
C851	5215347101	EL, 16V 470u
C855	5232333101	CD, 500V 330p, 10%
C856	5215422101	EL, 25V 220u
RESISTOR		
R801	5101106800	POWER, THERMISTOR
R802	5150107301	CEMENT, 10W 5k0
R803	5101106900	POSISTOR, 200V 20 R
R804	5142812995	CF, 1/4W 1R2
R805	5142439490	CF, 1/2W 390k
R806	5142820195	CF, 1/4W 200 R
R807	5142812295	CF, 1/4W 1k2
R808	5142412490	CF, 1/2W 120k
R810	5142415490	CF, 1/2W 150k
R811	5142827095	CF, 1/4W 27 R
R812	5142810395	CF, 1/4W 10k
R813	5162101920	VR, 1/4W 10k
R814	5142882295	CF, 1/4W 8k2
R815	5150107302	CEMENT, 10W 45k
R816	5136310107	MOF, 1W 100 R
R817 RA	5130315404	MOF, 1W 150k
R817 RB	5142515401	CF, 1W 150k
R818	5142818295	CF, 1/4W 1k8
R819	5142824195	CF, 1/4W 240 R
R820	5142882295	CF, 1/4W 8k2
R821, R822	5142822495	CF, 1/4W 220k
R823	5142801094	CF, 1/4W 1R0
R830	5145827290	CF, 1/4W 2k7
SEMICONDUCTORS		
D801 RA	6611024700	DIODE, KBL06
D801 RB	6611024701	DIODE, RS405L
D805 RA	6611012701	DIODE, V19G
D805 RB	6613002206	DIODE, SWITCHING RGP10J
D806 - D808, D811 RA	6613002202	DIODE, SWITCHING V09E
D806 - D808, D811 RB	6613002205	DIODE, SWITCHING RGP10G
D810 RA	6611012701	DIODE, RECTIFIER V19G
D810 RB	6613002206	DIODE, SWITCHING RGP10J
D812 RA	6611012701	DIODE, RECTIFIER V19G
D812 RB	6613002206	DIODE, SWITCHING RGP10J
D820 - D822, D824 - D826	6611013006	DIODE, RECTIFIER RGP15G

CIRCUIT REF.	PART NUMBER	DESCRIPTION
D823	6611013033	DIODE, RECTIFIER RGP15J
Q801	6621030800	TR, NPN 2SC3461
Q802	6621019101	TR, NPN 2SC2482
Q803 RA	6631001800	THYRISTOR, SCR
Q803 RB	6631001700	THYRISTOR, SCR
IC801	6644058800	IC, TDA4601
FUSE		
⚠F801	5054410501	FUSE, 250V 2.5A
COIL		
L801	5061106600	CORE, B01-AT1F
L802	5062102400	COIL, CHOKE TRF-9229
L833, L837, L842, L847	5062217000	COIL, LOSS TSH-170
L852	5062216900	COIL, LOSS TSH-169
TRANSFORMERS		
⚠T801 RA	5061337101	TPW-371A
⚠T801 RB	5061337102	TPW-371B

8-6 ASSEMBLY, PCB-POWER LINE FILTER PWB-1254-05

CAPACITORS		
⚠C827, C828	5270101501	POLYESTER, 250V 0u47
⚠C829, C830	5230102701	CERAMIC, 400V 4n7
RESISTOR		
R826	5142830490	CF, 1/4W 300k
COILS		
L202	5061102900	TOROID, CORE
⚠L804	5061106900	LINE CHOKE, 40mH

8-7 ASSEMBLY, PCB-INDICATOR PWB-1357-01

SEMICONDUCTORS		
D001	6618014200	DIODE, LED GRN
D002	6618014300	DIODE, LED GRN/RED
D003	6613001760	DIODE, SWITCHING 1S2076
Q003 - Q006, Q009	6621003200	TR, NPN 2SC458C

8-8 MISCELLANEOUS

P204	5057404103	CABLE ASSY
P205	5056505204	4 - PIN SOCKET
P206	5056505104	3 - PIN SOCKET
P208	5056505104	3 - PIN SOCKET
P400, P500, P900	5050200600	TERMINAL SQUARE PIN
P404	5056501312	3 - PIN SOCKET
P410	5056501412	4 - PIN SOCKET
P801	5057409802	4 - PIN PLUG
P802	5057402312	3 - PIN PLUG
S202	5054518600	SLIDER SWITCH
⚠S801	5054519600	MAINS SWITCH
S802	5054524414	SLIDER SWITCH
⚠V901 RA	5051218176	CRT M34JDU30X66
⚠V901 RB	5051219501	CRT E8034B22-TC67ETHT (G7Y)
L901	5060114401	DEGAUSSING COIL

CIRCUIT REF.	PART NUMBER	DESCRIPTION
	5057404103	SIGNAL CABLE (D-SUB 9P)

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
D826	6611013006	DIODE, RECTIFIER RGP15G
Q801	6621030800	TR, NPN 2SC3461
Q802	6621019101	TR, NPN 2SC2482
Q803 RA	6631001800	THYRISTOR, SCR
Q803 RB	6631001700	THYRISTOR, SCR
IC801	6644058800	IC, TDA4601
FUSE		
F801	5054410501	FUSE, 250V 2.5A
COIL		
L801	5061106600	CORE, B01-AT1F
L802	5062102400	COIL, CHOKE TRF-9229
L833	5062217000	COIL, LOSS TSH-170
L837	5062217000	COIL, LOSS TSH-170
L842	5062217000	COIL, LOSS TSH-170
L847	5062217000	COIL, LOSS TSH-170
L852	5062216900	COIL, LOSS TSH-169
TRANSFORMER		
T801 RA	5061337101	TPW-371A
T801 RB	5061337102	TPW-371B

ASSEMBLY, PCB-INDICATOR PWB-1357-01

SEMICONDUCTOR		
D001	6618014200	DIODE, LED GRN
D002	6618014300	DIODE, LED GRN/RED
D003	6613001760	DIODE, SWITCHING 1S2076
Q003	6621003200	TR, NPN 2SC458C
Q004	6621003200	TR, NPN 2SC458C
Q005	6621003200	TR, NPN 2SC458C
Q006	6621003200	TR, NPN 2SC458C
Q009	6621003200	TR, NPN 2SC458C

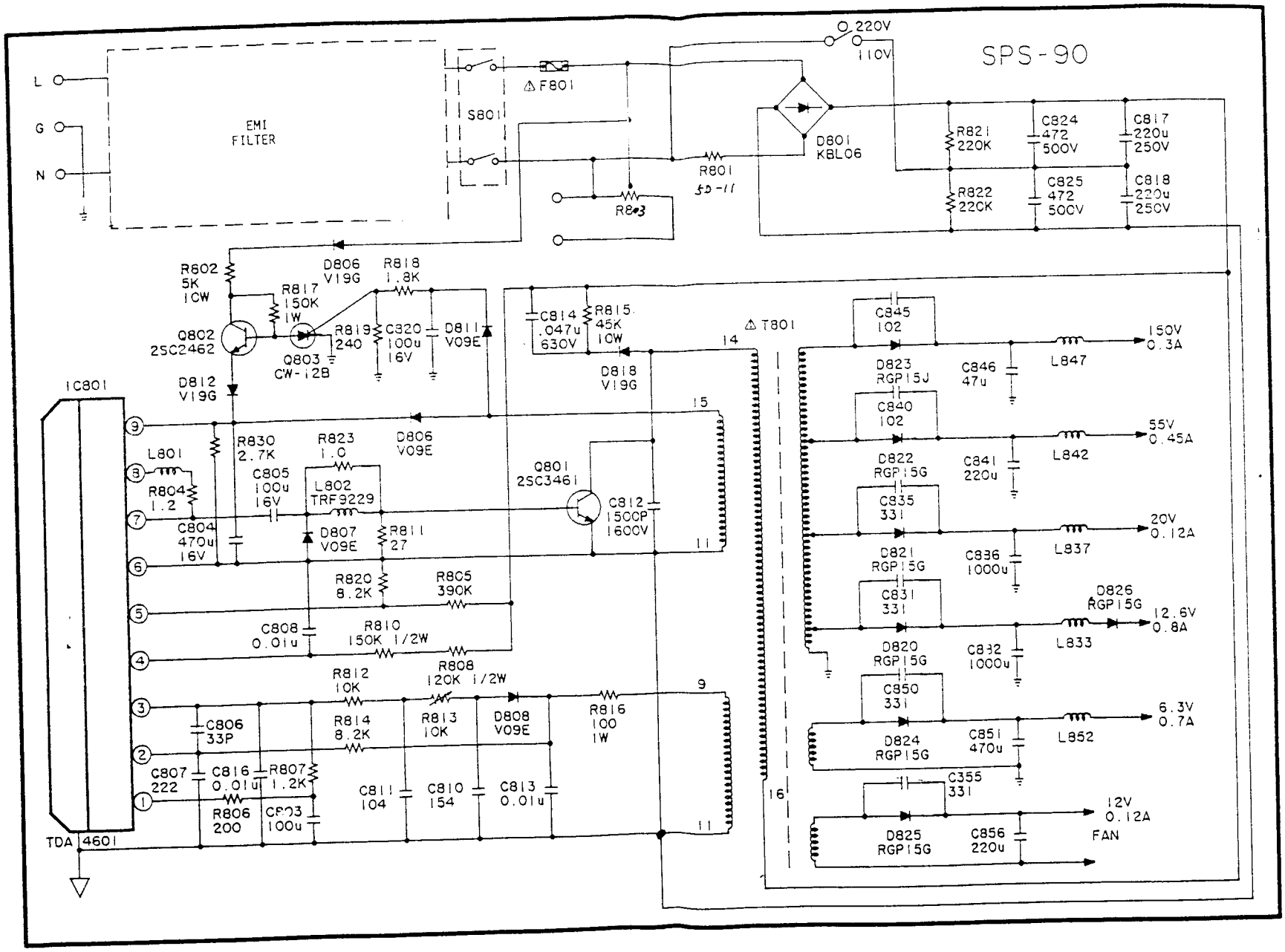


Fig 7-2 POWER CIRCUIT DIAGRAM

CHAPTER 7

SCHEMATIC DIAGRAM

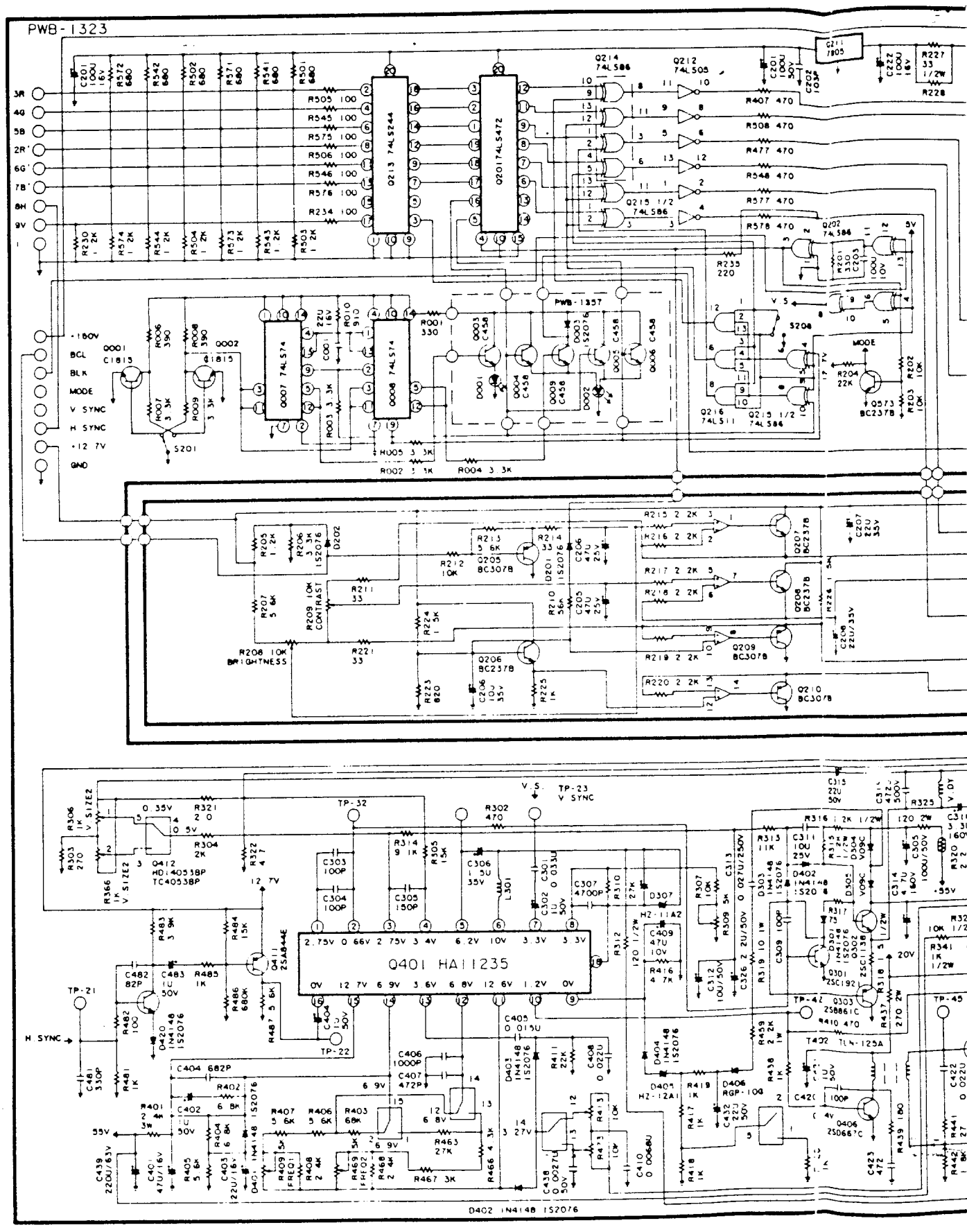
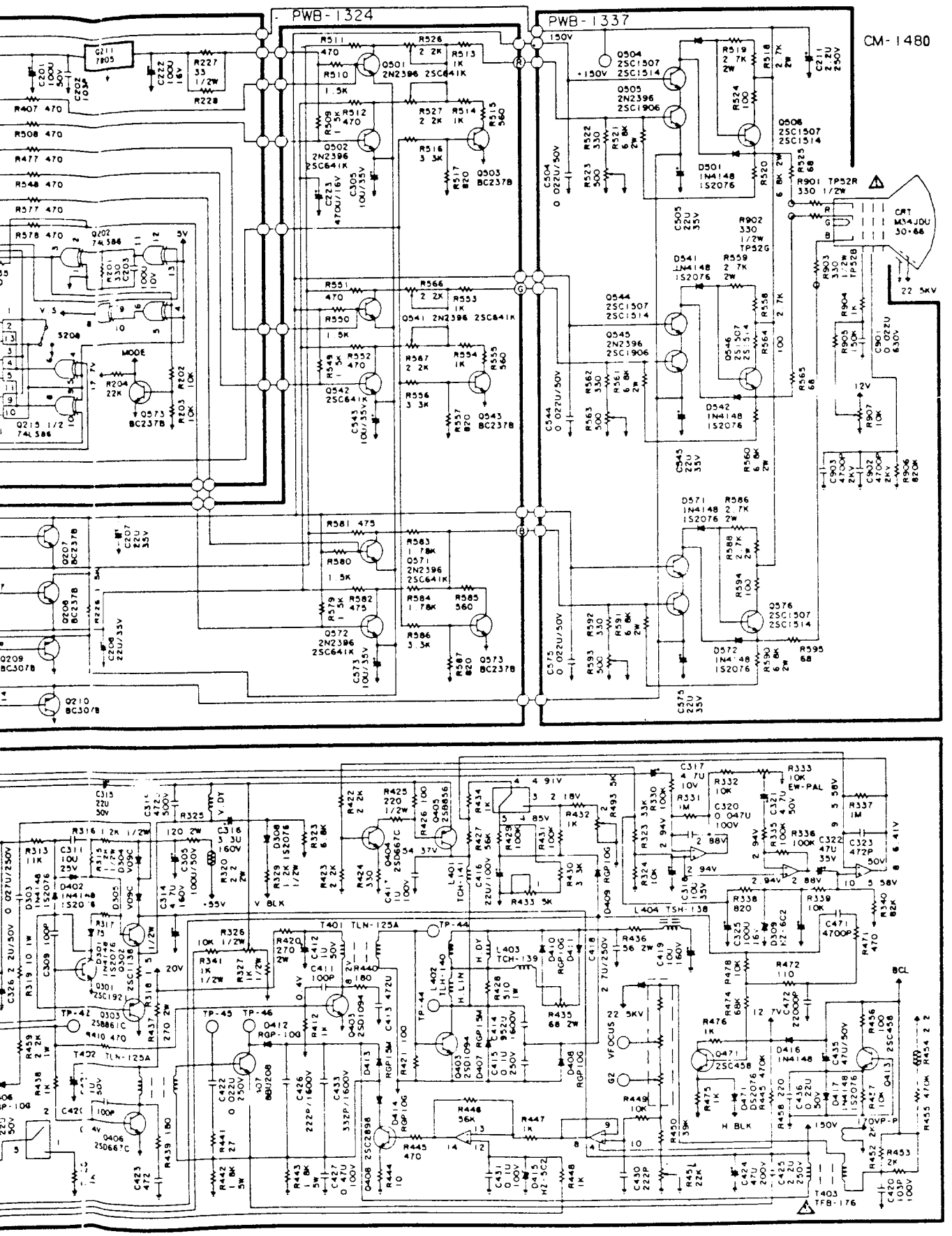


Fig 7-1 MAIN CIRCUIT DIAGRAM


PWB-1324
PWB-1337
CM-1480
CRT
M34JDU
30-68
22.5KV
Q211
7805
Q202
74LS86
Q215 1/2
74LS86
S208
MODE
Q573
BC237B
Q207
BC237B
Q208
BC237B
Q209
BC307B
Q210
BC307B
Q501
2N2396 2SC641K
Q502
2N2396
2SC641K
Q503
BC237B
Q504
2SC1507
2SC1514
Q505
2N2396
2SC1906
Q506
2SC1507
2SC1514
Q541
2N2396 2SC641K
Q542
2SC641K
Q543
BC237B
Q544
2SC1507
2SC1514
Q545
2N2396
2SC1906
Q546
2SC1507
2SC1514
Q571
2N2396
2SC641K
Q572
2N2396
2SC641K
Q573
BC237B
Q576
2SC1507
2SC1514
D501
1N4148
1S2076
D541
1N4148
1S2076
D542
1N4148
1S2076
D571
1N4148
1S2076
D572
1N4148
1S2076
T401 TLN-125A
T402 TLN-125A
T403
TFB-176
L401
TCH-141
L402
TLH-140
L403
TCH-139
L404 TSH-138
TP-42
TP-44
TP-45
TP-46
V DY
H DY
H LIN
V BLK
H BLK
VFOCUS
G2
BCL

CHAPTER 7

SCHEMATIC DIAGRAM

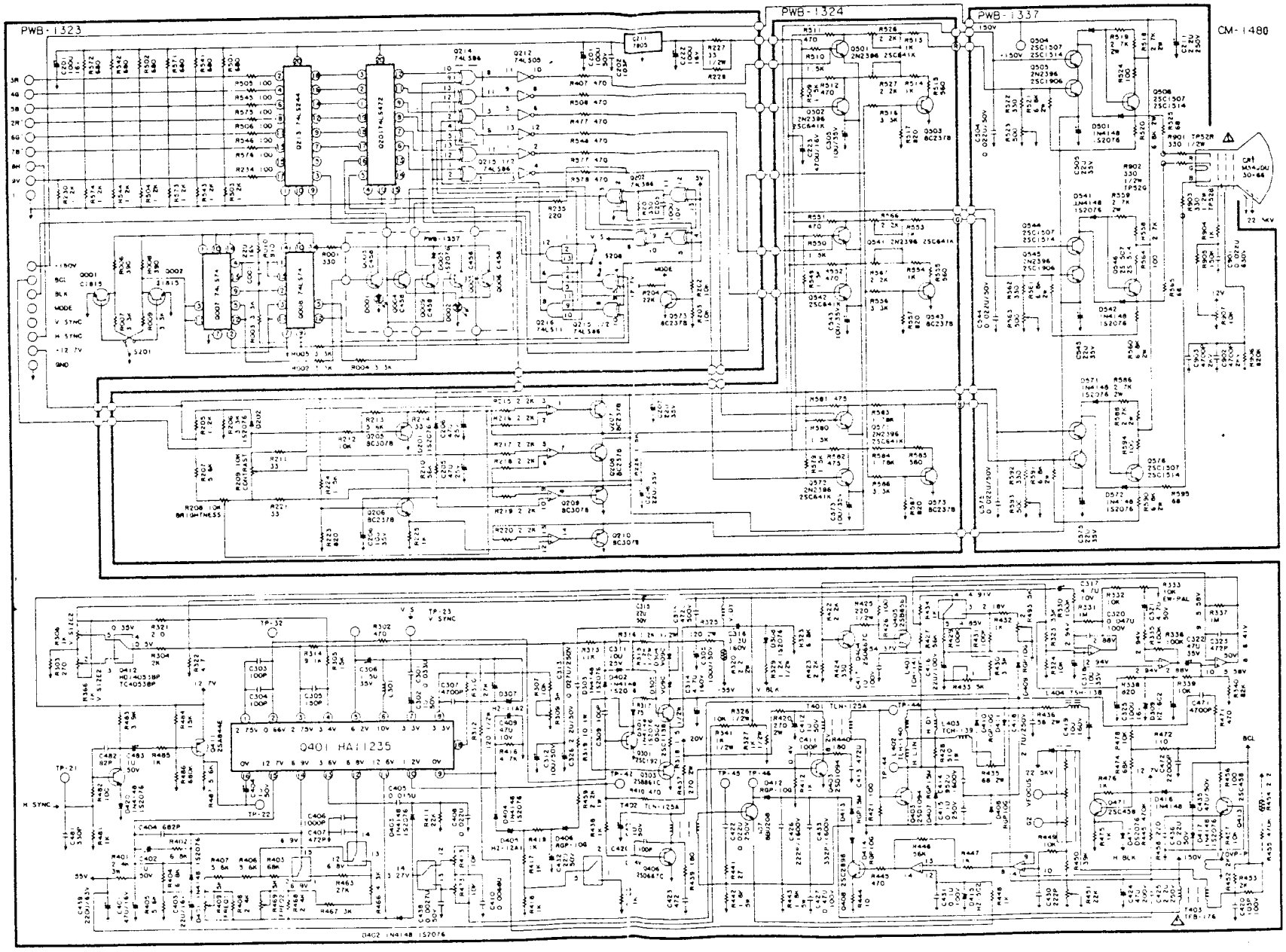


Fig 7-1 MAIN CIRCUIT DIAGRAM

CM-1480 SERIES COLOUR DISPLAY MONITOR

SERVICE MANUAL

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8-4 ASSEMBLY, PCB-CRT DRIVE PWB-1337-02.....8.9

8-5 ASSEMBLY, PCB-POWER PWB-1345-02.....8.10

8-6 ASSEMBLY, PCB-POWER LINE FILTER PWB-1254-05.....8.12

8-7 ASSEMBLY, PCB-INDICATOR PWB-1357-01.....8.12

8-8 MISCELLANEOUS.....8.13

CHAPTER 1

SPECIFICATIONS

APPLICATION:	Typical data display device for personal computer applications.
POWER INPUT:	90 watts (Nominal), AC rated voltage-refer to backcover label. A 2 metre 3-wire mains cord is supplied.
VIDEO SIGNALS:	16 colour: Red, green, blue and intensity video signals. 64 colour: R,G,B, and r,g,b, (intensity) video signals. All are positive TTL.
SYNC. SIGNALS:	Horizontal: 15.75kHz +/- 300Hz (mode 1) or 21.853kHz +/- 300Hz (mode 2) positive TTL, autoswitching by TTL. Vertical: 47-63Hz positive TTL at mode 1. 47-63Hz negative TTL at mode 2.
SIGNAL CONNECTOR:	9-Pin D-shell connector.
DISPLAY TUBE:	14", 90 deflection, 29.1mm neck, 0.31mm dot pitch. dot inline, dark tint non-glare. Type No.: M34JDU30X66
DISPLAY AREA:	Width: 250mm Height: 170mm
DISPLAY COLOUR:	Mode 1: 16 colours. Mode 2: 64 colours.
DISPLAY CHARACTER:	2000 characters (80CH. X25 Row on 8x8 dot matrix)
DISPLAY TIME:	Horizontal: mode 1: 44.5us mode 2: 39.37us Vertical: mode 1: 12.58ms mode 2: 16.01ms
RETRACE TIME:	Horizontal: mode 1: 6.0us mode 2: 6.0us Vertical: mode 1: 1.2ms mode 2: 0.6ms
RESOLUTION:	Horizontal: 640 dots Vertical: mode 1: 200 scan lines (non-interlaced) mode 2: 350 scan lines (non-interlaced)
MISCONVERGENCE:	0.5mm Max. within data area.
USER CONTROLS:	Power on-off, brightness, contrast, vertical size 1, vertical size 2, Multi colour switch, horizontal centre 1, horizontal centre 2. video reverse switch, power voltage 120VAC/240VAC selector.
SERVICE CONTROLS:	H-Hold 1, H-Hold 2, H-Width 2, H-Centre, V-Centre, V-Hold, Focus, Screen, E-W Pincusion, set EHT, R-Drive, r-Drive, G-Drive, g-Drive, R-BKG, G-BKG, B+12.75V.
ENVIRONMENTAL:	Operation: 10°C to 35°C ambient Storage: -40°C to 50°C Humidity: 50% to 80% (non-condensing) Altitude: to 7000 feet above sea level.
DIMENSIONS:	365 (W) X 315 (H) X 400 (D) mm
WEIGHT:	13.5kg (net)

ENVIRONMENTAL:	Operation: 10°C to 35°C ambient Storage: -40°C to 50°C Humidity: 50% to 80% (non-condensing) Alitude: to 7000 feet above sea level.
DIMENSIONS:	365 (W) X 315 (H) X 400 (D) mm
WEIGHT:	13.5kg (net)

CHAPTER 2

PRECAUTIONS AND NOTICES

2-1 SAFETY PRECAUTIONS

1. Observe all cautions and safety related notes located inside the display cabinet and on the display chassis.

2. Operation of these displays outside the cabinet or with the cover removed, involves a shock hazard from the display power supplies. Work on the display should not be attempted by anyone who is not thoroughly familiar with precautions necessary when working on high voltage equipment.

3. Do not install, remove or handle the picture tube in any manner unless shatter-proof goggles are worn. People not so equipped should be kept away while handling picture tube. Keep picture tube away from the body while handling.

4. The picture tube is constructed to limit X-RADIATION to 0.5 mR/HR at 300 microamperes anode current. For continued protection, use the recommended replacement tube only, and adjust the voltages so that the designated maximum rating at the anode will not be exceeded.

5. Before returning a serviced display to the customer, a thorough safety test must be performed to verify that the display is safe to operate without danger or shock. Always perform an AC leakage current check on the exposed metallic parts of the cabinet. Proceed as follows:

   Connect the monitor power lead to the mains supply, via an isolation transformer, and switch on. Using the test circuit shown in Fig. 2-1, measure the AC leakage current between each pole (L and N) of the supply and all accessible metal parts. The earth leakage current must not exceed 3.5mA.

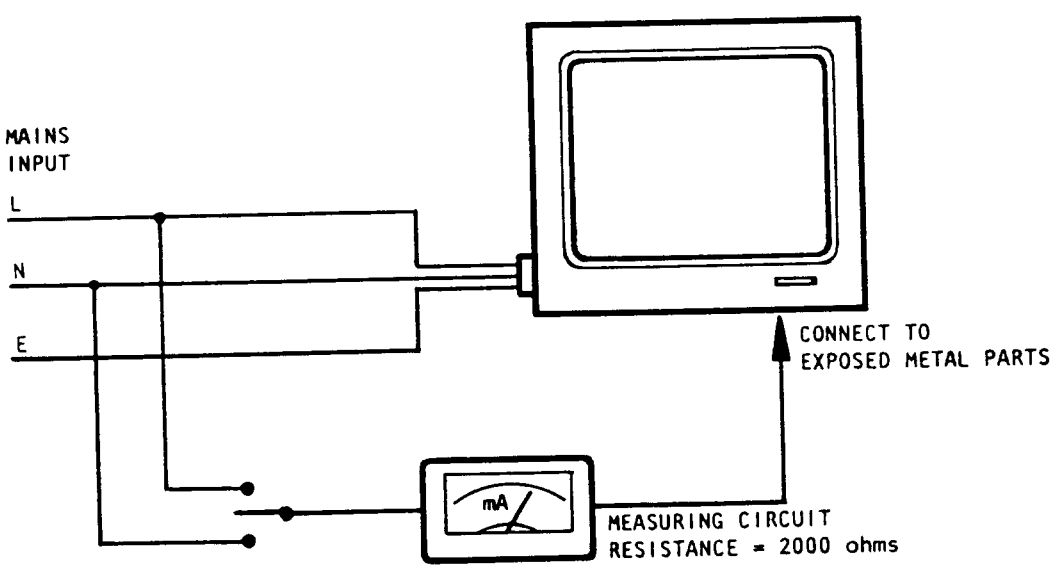


Fig 2-1 AC LEAKAGE CURRENT TEST CIRCUIT

2-2 PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this chassis provide special visual safety protection. The protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. .
Before replacing any of these components, read the parts list in this manual carefully. The use of substitute replacement parts which do not have the same safety characteristics as specified in the parts list may create shock, fire, X-RAY radiation or other hazards.

2-3 SERVICE NOTES

1. When replacing parts or circuit boards, wrap the wires around terminals before soldering.

2. When replacing a high wattage resistor (more than 1/2W) on a circuit board, keep the resistor about 10mm (1/2 in.) away from circuit board.

3. Keep wires away from high voltage or high temperature components.

4. Keep wires in their original position so as to reduce interference.

WARNING

CHECK POWER VOLTAGE SELECTOR IS CORRECT !

120 VAC OR 240 VAC

CHAPTER 3

OPERATING INSTRUCTIONS

3-1 CONTROLS AND CONNECTIONS

* POWER: The power rocker switch turns the monitor on or off.

* MULTI COLOUR INDICATOR: A green LED lights when the monitor is switched on with colour displayed on the normal state. Push Multi-colour switch on the front to appropriate position for desired display.

* BRIGHTNESS: The brightness control sets the overall or average intensity of illumination of the display

* CONTRAST: The contrast control sets the intensity of the data displayed.

* 120/240VAC SELECTOR: The selector switch adapts the monitor for operation from the local AC power source.

* V. SIZE (1 and 2): The vertical size adjustments (mode 1 and mode 2) set the amount of vertical (top to bottom) raster deflection.

* H. PHASE (1 and 2): The horizontal phase adjustments (mode 1 and mode 2) set the horizontal (left to right) position of the display within the raster area.

* POWER INPUT JACK: A 3-pin power connector is located on the rear panel.

* POWER LEAD: A 2m 3-wire mains lead connects power to the monitor.

* VIDEO SIGNAL CABLE: A 1.5m cable, terminated with a 9 Pin D-type connector, supplies video and sync. signals to the monitor. The cable is attached to the monitor and is not detachable. Fig 3-1 illustrastes the D-type connector. Table 3-1 lists the connector signal for each mode of operation.

* VIDEO REVERSE SWITCH: Move the switch to reverse the background and image colours.

3-2 Set up and Operation:
Perform the following steps to set up and operate the monitor.

1. Place the monitor on a flat surface near the computer and near an AC power outlet. Be certain that the ventilation slots in the cabinet are not blocked or obstructed.

2. Connect the video signal cable from the monitor to the computer.

3. Plug the power cord into the monitor and then into an AC outlet. Be certain that the 120/240 VAC selector switch on the rear panel is set to the correct position.

WARNING: Removing the earth from the AC power source may present a potentially lethal shock hazard.

4. Turn on the computer and the monitor. The front panel green LED should light. The system prompt for the computer should be displayed.

5. Adjust the left panel brightness and contrast controls to obtain a comfortable display.

If your CM-1480 monitor requires service, refer to the controls and adjustments information of this publication and verify that all controls and adjustments on the display are correctly set. If your monitor does require service, it must be returned with the mains lead.

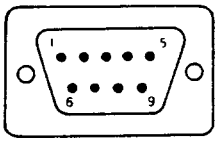


Fig 3-1 9-Pin Colour Monitor
Signal Cable

Table 3-1

Pin No.	Description	
	Mode 1	Mode 2
1	Shield Gnd.	Ground
2	Signal Gnd.	r
3	Red	R
4	Green	G
5	Blue	B
6	Intensity	g
7	Unused	b
8	Horiz. sync.	Horiz. sync.
9	Vert. sync.	Vert. sync.

CHAPTER 4

ADJUSTMENTS

4-1

This chapter contains instructions for performing the various monitor adjustments. Because these adjustments are performed while the monitor is switched on, observe proper precautions to avoid personal injury. Specific warnings are included where necessary.

Paragraph 4-2 lists the various adjustment devices and their component numbers. They are arranged according to the circuit board or location where they can be found. If a particular adjustment does not correct a problem, refer or section 5 for additional information.

4-2 Monitor Adjustment Devices

	DEVICE	DESCRIPTION
	EXTERNAL	
	R208	Left panel brightness control
	R209	Left panel contrast control
	VIDEO BOARD (PWB-1324)	
	R526	Primary red drive
	R527	Secondary red drive
	R566	Primary green drive
	R567	Secondary green drive
	CRT BOARD (PWB-1337)	
	R523	Red cut-off
	R563	Green cut-off
	R593	Blue cut-off
	MAIN BOARD (PWB-1337)	
	R309	Vertical hold
	R306	Vertical size, mode 1 (Rear panel)
	R366	Vertical size, mode 2 (Rear panel)
	R326	Vertical centring
	R408	Horizontal hold, mode 1
	R468	Horizontal hold, mode 2
	R433	Horizontal width, mode 1
	R493	Horizontal width, mode 2
	R413	Horizontal phase, mode 1 (Rear panel)
	R473	Horizontal phase, mode 2 (Rear panel)
	R435	Horizontal centring
	R333	E-W pincusion
	R907	Sub-brightness
	R451	22.5kV EHT
	POWER SUPPLY	
*	R813	B+ 12.8 +/-0.1V
	OTHER	
	Focus VR	High voltage resistor block
	G2 VR	High voltage resistor block

4-3 PREPARATION

Perform the following steps to prepare the monitor for adjustment:
(1) Remove the cabinet back to access internal adjustments.

(2) Turn the monitor on and allow it to warm up for approximately 30 minutes.

(3) Read each adjustment procedure before performing it.

1. B+ ADJUSTMENT

The switch-mode power supply has a B+ output voltage adjustment located within the unit. Variable resistor R813 sets the 12.80 VDC output.

WARNING: The switch-mode power supply contains circuits that generate dangerous high-frequency, high amplitude signals that present a potentially lethal shock hazard. Exercise extreme caution when adjusting or working near this unit.

Using a DVM, measure the 12.80V B+ voltage and adjust R813 to obtain a reading of 12.80V, +/-0.1V. R813 may be accessed through a hole labeled B-ADJ in the side of the power supply enclosure.

2. VERTICAL HOLD

The vertical hold adjustment prevents the display from rolling upwards or downwards. Adjust R309 to stabilize the display by turning it first to one extreme and then backing off until the display just stabilizes. Repeat this procedure from the opposite extreme until the display just stabilizes. Set R309 between the two settings that stabilize the display.

3. VERTICAL SIZE

The vertical size adjustment sets the amount of vertical (top to bottom) raster deflection. The vertical size adjustments for both mode 1 and mode 2 are located externally on the rear panel. To adjust vertical size;

(1) Turn the G2 control clockwise until the raster just appears.

(2) Adjust R306 (V. SIZE 1) or R366 (V.SIZE 2) for a raster height of 170mm +/-2mm in each mode 1 or mode 2 respechively.

(3) Turn the G2 control counterclockwise until the raster just disappears.

4. VERTICAL CENTRING

The vertical centring adjustment shifts the whole display up or down within the raster. To adjust centring:

(1) Verify that the vertical size is correct. Adjust if necessary.

(2) Turn the G2 control clockwise until the raster just appears.

(3) Adjust R326, the vertical centring pot, so that the display is centred from top to bottom within the raster.

(4) Turn the G2 control counterclockwise until the raster just disappears.

5. HORIZONTAL HOLD

The horizontal hold adjustment prevents the display from shifting horizontally and breaking up in diagonal segments. To adjust the horizontal hold:

(1) Connect a jump lead from test point TP22 to earth.

(2) Adjust R408 (mode 1) or R468 (mode 2) to eliminate horizontal tearing and restore horizontal hold.

(3) Remove the jump lead from TP22.

6. HORIZONTAL WIDTH

The horizontal width adjustment sets the amount of horizontal (left to right) raster deflection. To adjust horizontal width:

(1) Turn the G2 control clockwise until a raster just appears.

(2) Adjust R433 (mode 1) or R493 (mode 2) so that the display width is 250mm +/- 2mm in each mode.

(3) Turn the G2 control counterclockwise until the raster just disappears.

7. HORIZONTAL PHASE

The horizontal phase adjustment sets the left-to-right position of the display within the raster area. To adjust horizontal phase:

(1) Turn the G2 control clockwise until the raster just appears.

(2) Adjust R413 (mode 1) or R473 (mode 2) to centre the display from left to right within the raster.

(3) Turn the G2 control counterclockwise until the raster just disappears.

8. HORIZONTAL CENTRING

The horizontal centring adjustment shifts the whole raster from left to right for mode 2. This adjustment is only present for mode 2. To adjust horizontal centring:

(1) Turn the G2 control clockwise until the raster just appears.

(2) Adjust R435 to centre the raster from left to right for mode 2.

(3) Turn the G2 control counterclockwise until the raster just disappears.

9. RGB DRIVE

The red and green drive adjustments set the amplitudes of the red and green CRT drive voltages relative to the blue drive voltage. (There is no blue drive adjustment.) When set properly, all three

(RGB) drive voltages will be the same. To adjust the red and green drive voltages:

(1) Display a white field.

(2) Set the left panel contrast and brightness controls to maximum.

(3) Using an oscilloscope, measure and record the amplitude of the blue drive voltage at TP52B on the CRT drive board. This value should be approximately 60 Vp-p.

(4) Next, measure the amplitude of the red drive voltage at TP52R. If necessary, adjust the two red (R and r) drive pots (R526 and R527) so that the amplitude of the red drive voltage matches that of the blue drive voltage recorded in step 3.

(5) Measure the amplitude of the green drive voltage at TP52G. If necessary, adjust the two green (G and g) drive pots (R566 and R567) so that the amplitude of the green drive voltage matches that of the blue drive voltage recorded in step 3.

10. HORIZONTAL LINE PRECISION

The horizontal line precision adjustment sets the relative contributions of the R, G, and B bias controls to produce a white horizontal line. This adjustment should be performed under low light. To adjust the horizontal line precision:

(1) Remove the input signal from the monitor. (Disconnect video cable from the computer.)

(2) Set the left panel contrast control to maximum and the left panel brightness control to minimum.

(3) Set the R,G, and B cutoff controls (R523, R563, and R593) to mid-position.

(4) Set sub-brightness control R907 to its mid-position.

(5) Adjust G2 for 500 VDC. G2 voltage may be measured from the foil side of the CRT drive board.

(6) Connect a jump lead between points M and N on the main board.

(7) Turn the R cutoff control (R523) counterclockwise until a red horizontal line just appears.

(8) Turn the G and B controls (R563 and R593) counterclockwise until a white line is displayed.

(9) Remove jump lead connecting points M and N.

(10) Perform the brightness level adjustment procedure in the following section.

11. BRIGHTNESS LEVEL

The sub-brightness control (R907) sets the threshold for the front panel brightness control. This control should be adjusted with the monitor in mode 2. Adjustment should be performed under low light.

To adjust the brightness level:

(1) Display a white field on the entire screen.
(2) Set the front panel brightness control to minimum.

(3) Adjust R907 so that the display just disappears.

12. E-W PINCUSHION

The E-W pincushion adjustment reduces the horizontal pincushion distortion of the raster. (Pincushion distortion is characterized by sides of the display which bow inward, especially toward the centre of the display.)
This control should be adjusted with the monitor in mode 2. To adjust the E-W pincushion:

(1) Display a crosshatch pattern.

(2) Adjust R333 so that any horizontal pincushion distortion is corrected.

13. FOCUS

The focus adjustment (the upper control on high-voltage resistor block) varies the focus voltage to produce the sharpest display detail. To adjust the focus:

(1) Display a dot test pattern.

(2) Set the front panel contrast and brightness controls for a comfortable display.

(3) Adjust the focus control for best overall focus. Check the centre, top centre, bottom centre, left centre, and right centre areas of the display for good focus.

(4) Verify acceptable overall focus using the fill screen test with such characters as @ and #.

14. STATIC CONVERGENCE

Static convergence adjustment refers to setting each electron beam so that all three beams (red, green and blue) hit the same spot. When all three beams hit the same spot on the CRT mask with equal intensity, a white dot appears on the screen. This adjustment should be performed under low light.

NOTE: Read the entire procedure thoroughly before performing this adjustment.
To adjust static convergence:

(1) Locate the convergence magnets on the neck of the CRT. Identify the 4-pole, 6-pole and purity magnets.
(2) Mark the present position of the magnets by drawing a pencil line along the sides of all the magnets. This will give you a reference point in case the adjustment becomes difficult.
(3) Carefully remove the clear adhesive glue which holds the magnets in place. The glue may be scraped away, but be careful not to damage the CRT neck.

(4) Rotate the 4-pole and 6-pole magnets slightly to loosen them. Do not force them; slowly work them back and forth until they can be moved with only moderate effort. Do not rotate the purity magnet.

(5) Turn the monitor on and allow it to warm up for approximately 30 minutes.

(6) Display a crosshatch pattern.

(7) Separate the three colours (red, green, and blue) horizontally and vertically. This is accomplished by rotating the 4-pole and 6-pole magnets until the three colours are visible. The resulting display shows three distinct horizontal lines (red, green, and blue) instead of one white horizontal line throughout the display. Similarly, the white vertical lines are now split into three distinct vertical lines (red, green, and blue).

(8) Superimpose the red and blue horizontal lines at the centre of the screen. This is accomplished by rotating both tabs of the 4-pole magnets simultaneously until the red and blue lines overlap to form one magenta line. Use a 10X or better magnifier to more precisely adjust the overlap once the line appears magenta to the unaided eye.

(9) Superimpose the red and blue vertical lines at the centre of the screen. This is accomplished by changing the angle between the 4-pole magnets until the red and blue lines overlap to form one magenta line. Use a 10x or better magnifier to more precisely adjust the overlap once the line appears magenta to the unaided eye.

(10) Verify that the red and blue horizontal and vertical lines are now superimposed and appear magenta. Because these adjustments are magnetic in nature, they are somewhat interactive. Repeat the previous two steps if necessary.

(11) Superimpose the magenta and green horizontal lines at the center of the screen. This is accomplished by rotating both tabs of the 6-pole magnets simultaneously until the magenta and green lines overlap to form one white line. Use a 10x or better magnifier to more precisely adjust the overlap once the line appears white to the unaided eye.

(12) Superimpose the magenta and green vertical lines at the centre of the screen. This is accomplished by changing the angle between the 6-pole magnets until the magenta and green lines overlap to form one white line. Use a 10x or better magnifier to more precisely adjust the overlap once the line appears white to the unaided eye.

(13) Verify that the magenta and green horizontal and vertical lines are now superimposed and appear white. Because these adjustments are magnetic in nature, they are somewhat interactive. Repeat the previous two steps if necessary.

(14) Verify overall convergence by once again examining the cross-hatch pattern. Check the horizontal and vertical lines at the centre of the screen for proper convergence. Repeat any steps as necessary.

15. ADJUSTMENT AND TEST LOCATION

(1) PCB-MAIN adjustment and test location. (See Fig 4-1)

(2) PCB-VIDEO DRIVE adjustment and test location. (See Fig 4-2)

(3) PCB-CRT DRIVE adjustment and test location. (See Fig 4-3)

(4) PCB-POWER adjustment and test location. (See Fig 4-4)

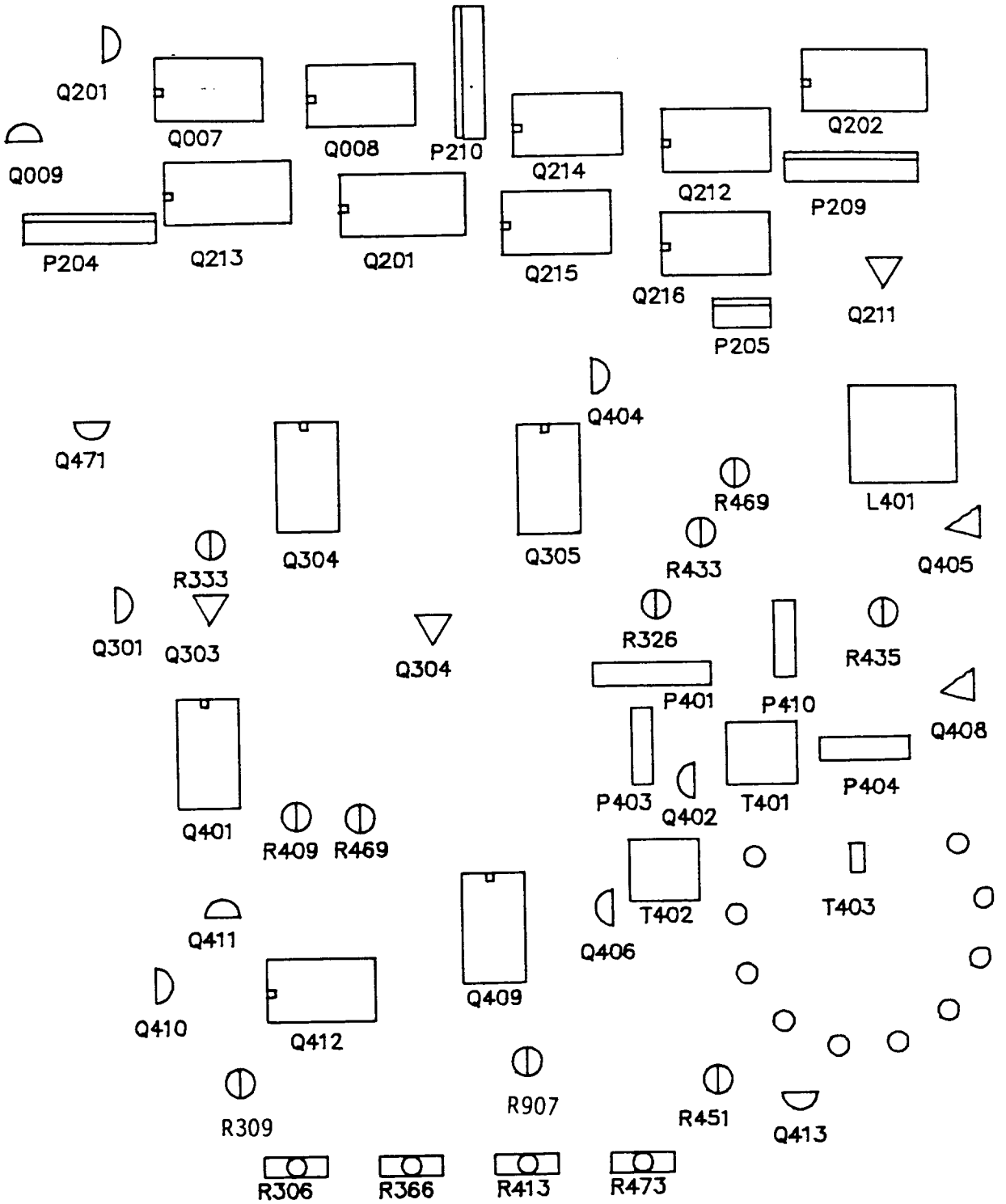
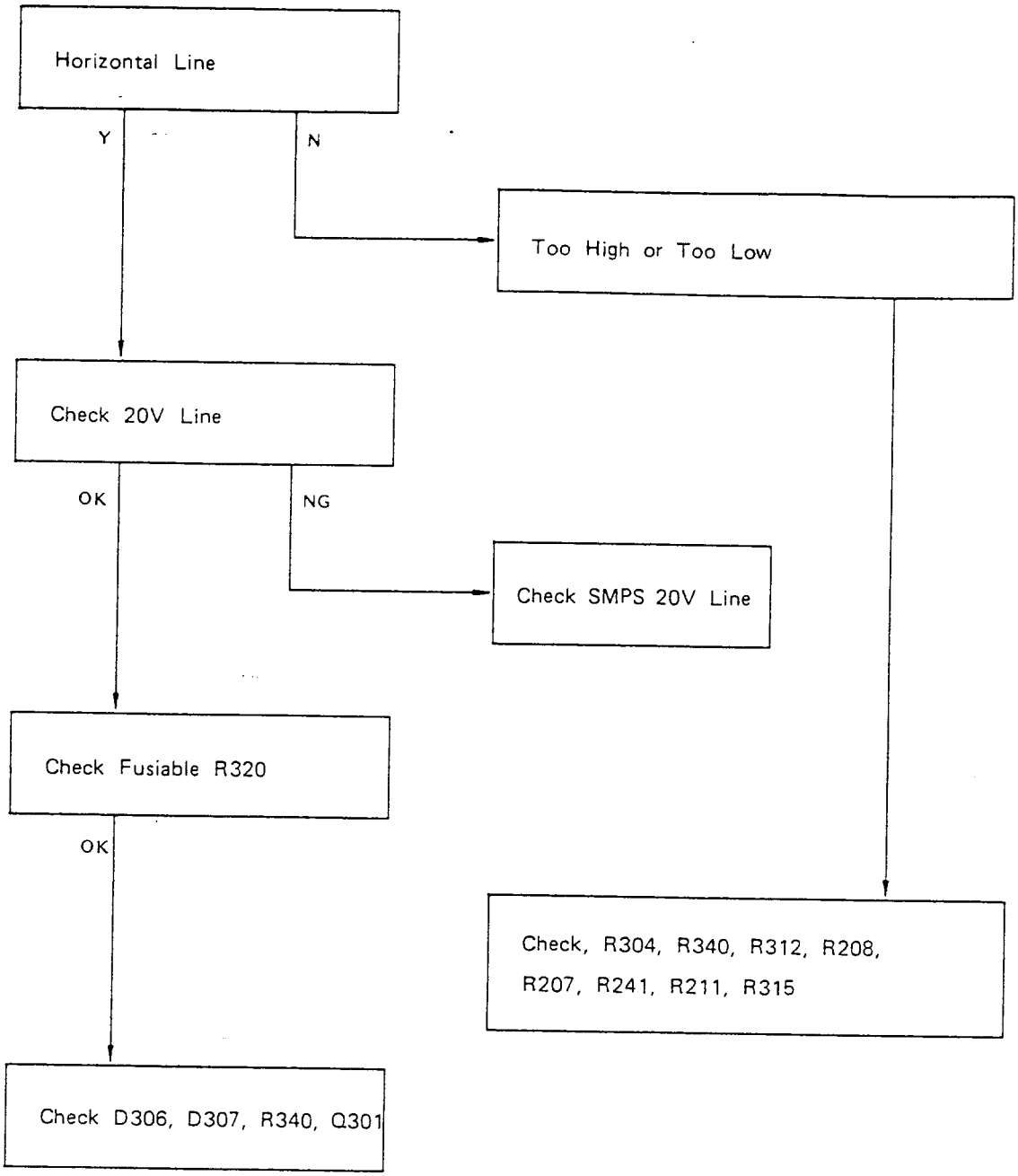
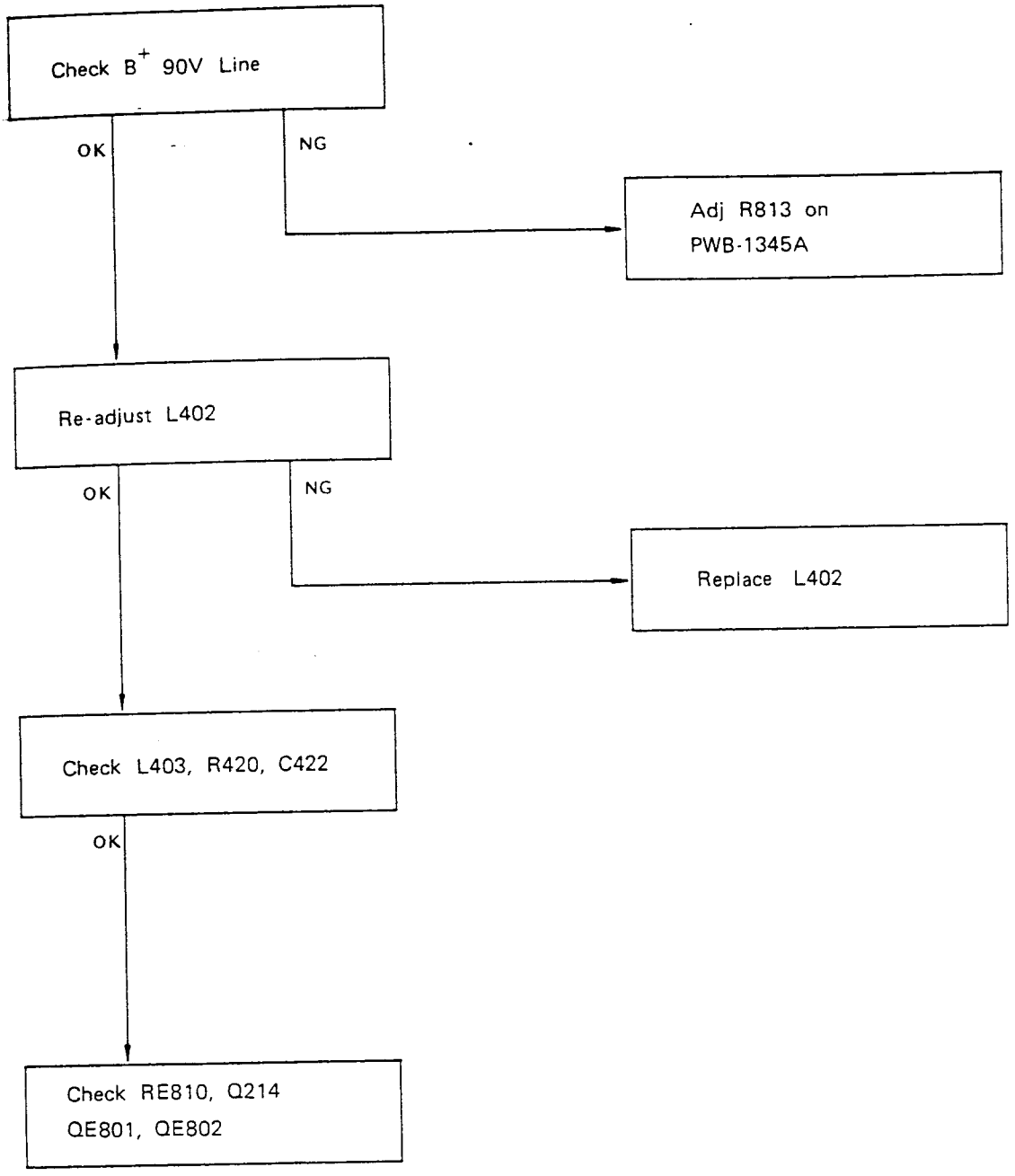


Fig 4-1 PCB-MAIN adjustment and test location

Abnormal Vertical Height

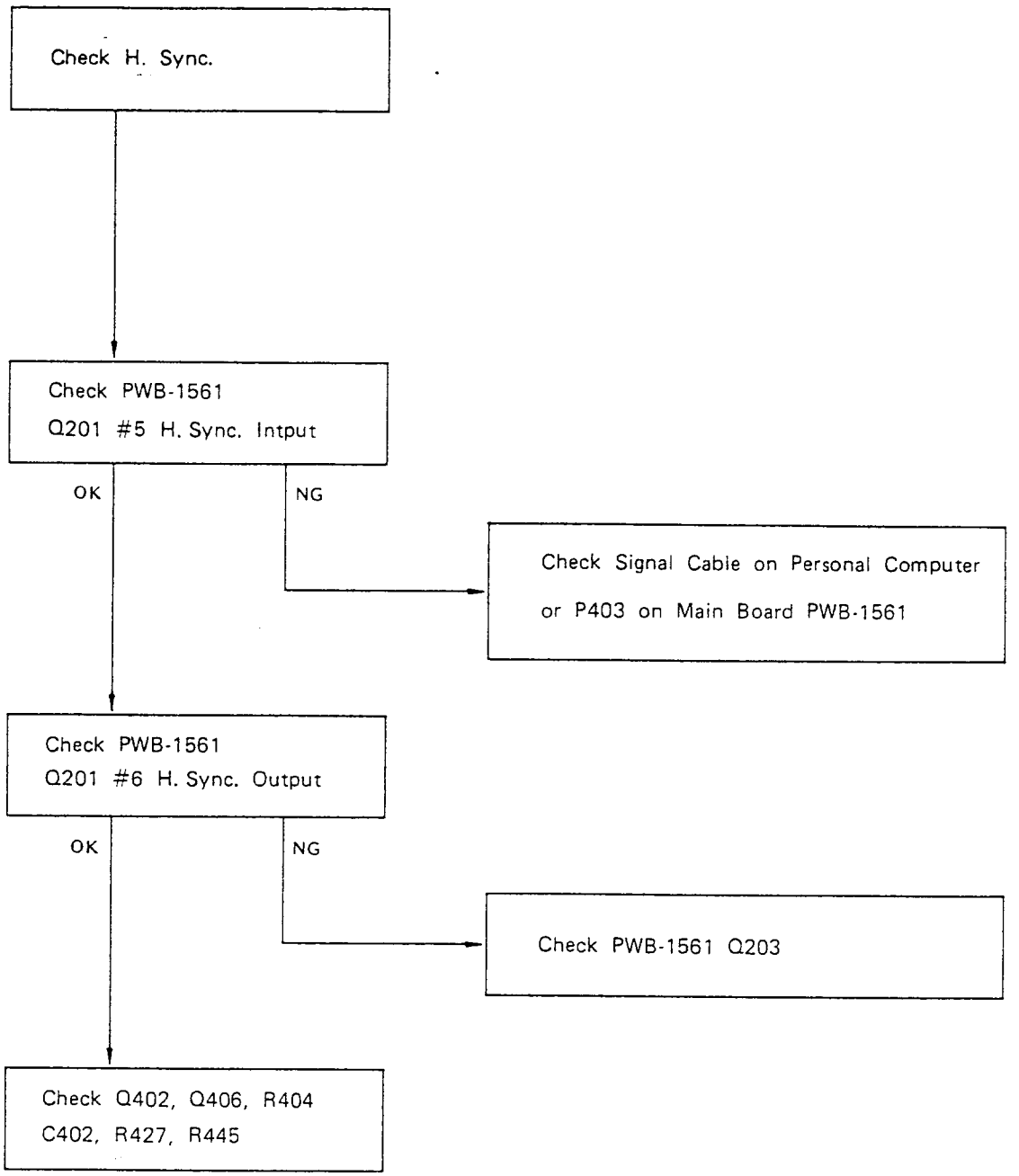


Abnormal Hor Width

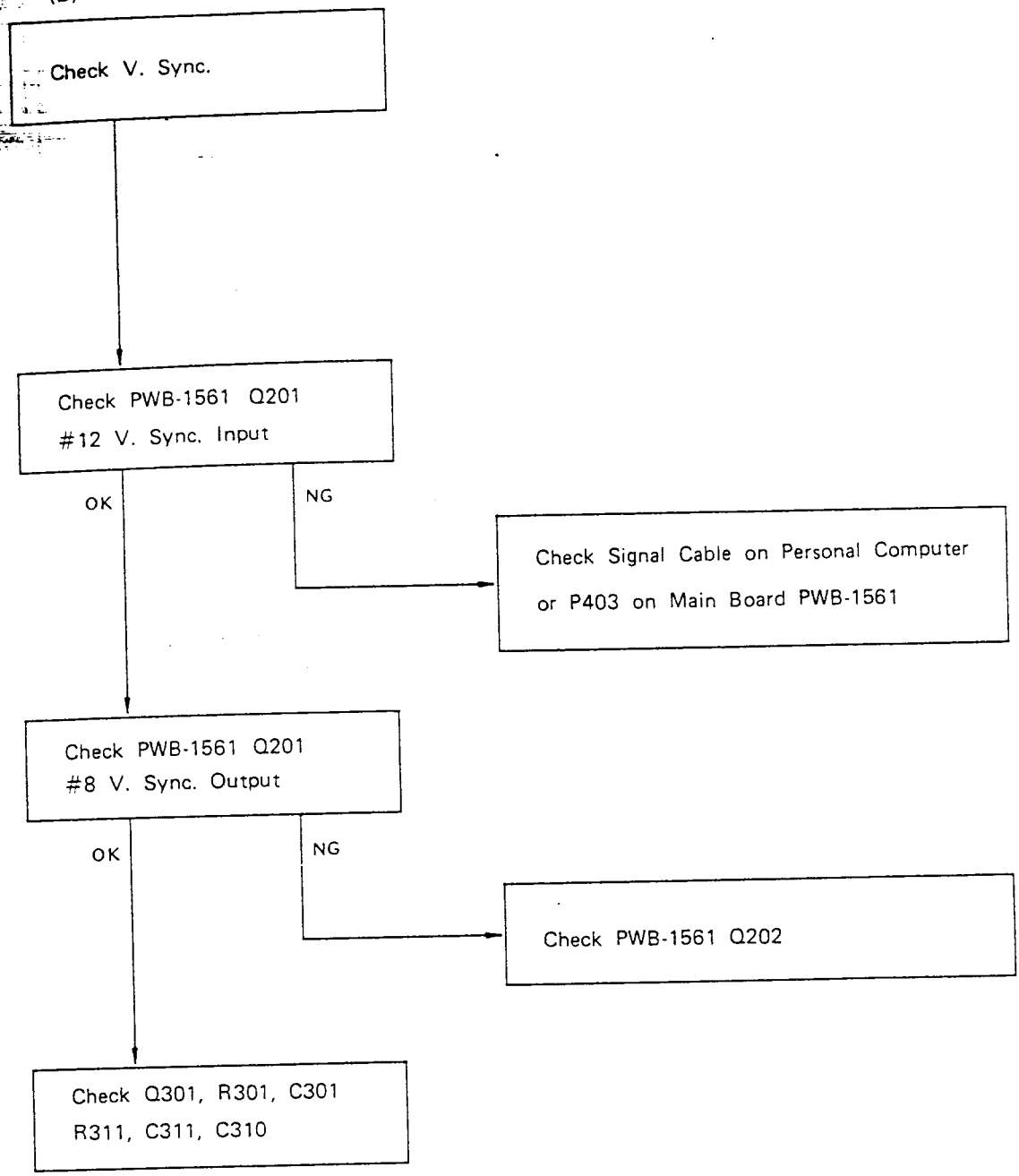


Unstable Synchronization

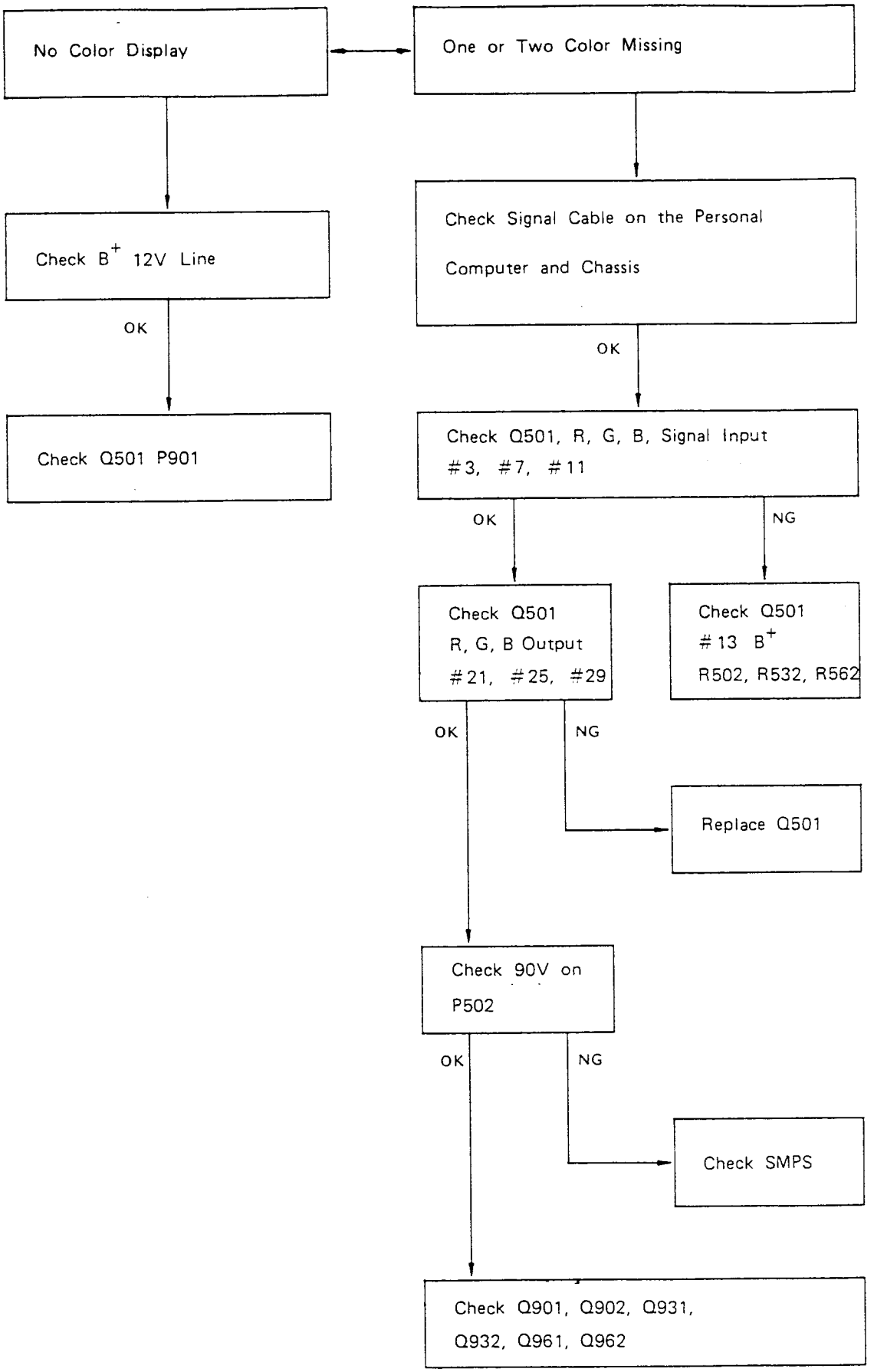
(A) Horizontal sync.



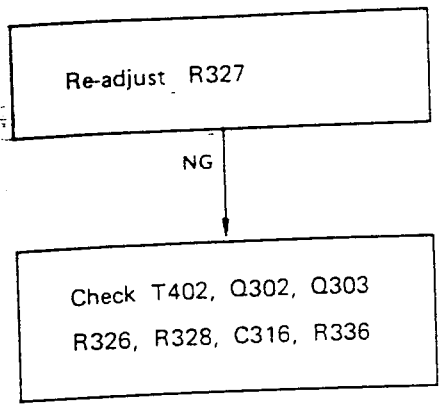
(B) Vertical sync.



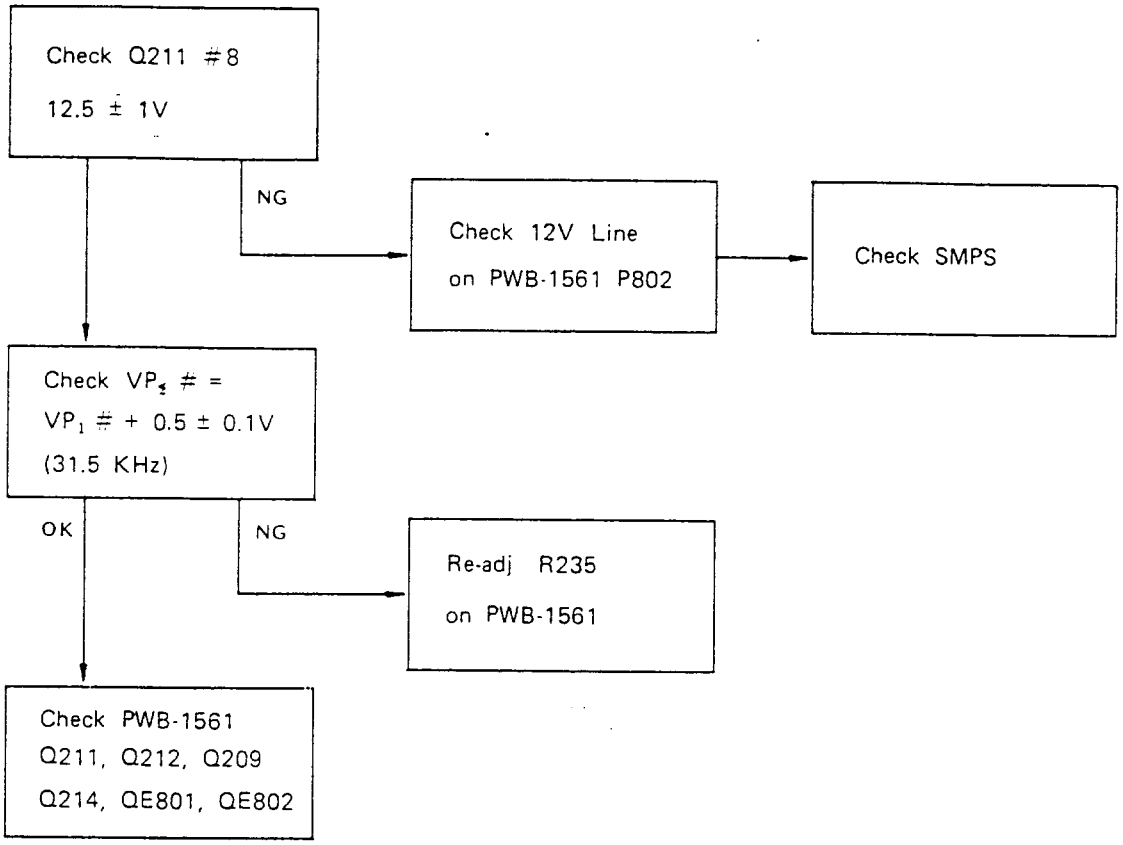
Abnormal Color Display



Abnormal Side Pincushion Distortion

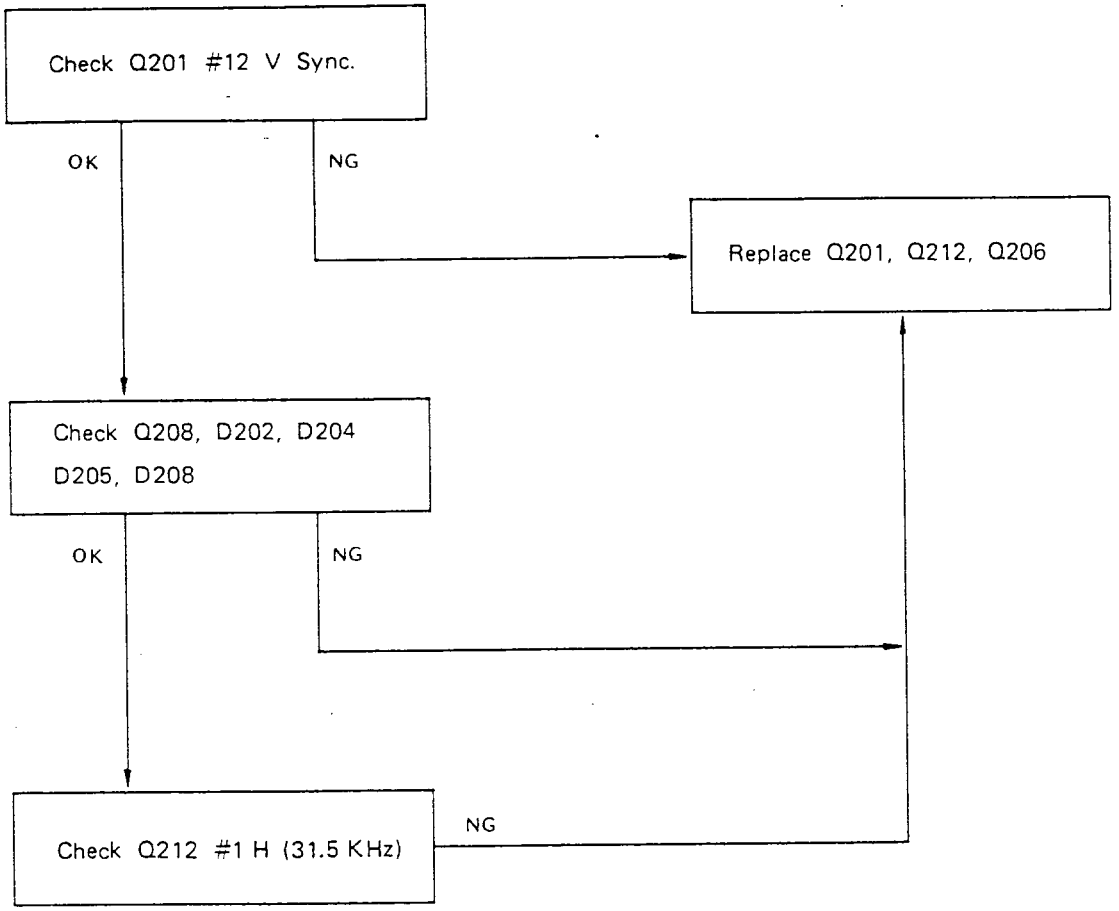


Abnormal 31.5 KHz/35.5 KHz Chage

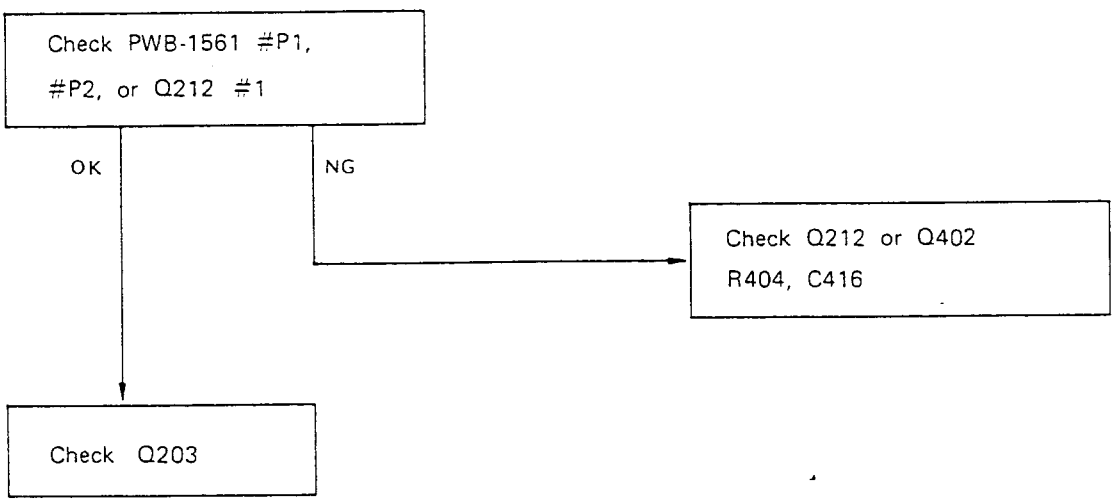


Abnormal Contral Board (PWB-101)

(A) Abnormal MODE 1 ~ MODE 5 Vertical Height



(B) Abnormal 31.5 KHz/35.5 KHz Hor Hold & Hor Phase Change



8.REPLACEMENT PARTS LIST

WARNING: Replacement parts which have special characteristics important to safety should be replaced only with types identical to those in the original circuit or specified in the parts list. Before replacing any of these components, read carefully the product safety precaution, do not degrade the safety of the display through improper servicing.

CKT NO.	PART NO.	DESCRIPTION	SPEC	
		ASSEMBLY,PCB-MAIN, PWB-1561-03		
CAPACITOR				
C201	5222110391	CAPACITOR,POLYESTER	CQ92M	50V10000.00PFJ
C202	5213410191	CAPACITOR,ELECTROLYTIC	CE04W	25V 100.00UFM
C203,C204	5213247091	CAPACITOR,ELECTROLYTIC	CE04W	10V 47.00MFM
C206	5222110491	CAPACITOR,POLYESTER	CQ92M	50V 0.10MFJ
C207	5222115391	CAPACITOR,POLYESTER	CQ92M	50V15000.00PFJ
C210	5213622891	CAPACITOR,ELECTROLYTIC	CE04W	50V 0.22UFM
C211	5221115291	CAPACITOR,POLYESTER	CQ93M	50V 1500.00PFJ
C212	5242210191	CAPACITOR,CERAMIC CC45	CH DC	50V 100.00PFJ
C213,C305	5222110491	CAPACITOR,POLYESTER	CQ92M	50V 0.10MFJ
C306				
C302	5213510213	CAPACITOR,ELECTROLYTIC	CE04W	35V 1000.00UFM
C303	5236310401	CAPACITOR,BARRIER,LAYER,CG45X	F DC	50V 0.10UFZ
C304	5213622112	CAPACITOR,ELECTROLYTIC	CE04W	50V 220.00UMM
C307	5222410401	CAPACITOR,POLYESTER P=7.5MM	CQ92M	100V 0.10UFJ
C308	5213247091	CAPACITOR,ELECTROLYTIC	CE04W	10V 47.00MFM
C309	5213410213	CAPACITOR,ELECTROLYTIC	CE04W	25V 1000.00UFM
C310	5275133401	CAPACITOR,METALLIZED P.E P=5MM	CF93M	63V 0.33MFJ
C311	5222110491	CAPACITOR,POLYESTER	CQ92M	50V 0.10MFJ
C312	5214410012	CAPACITOR,ELECTROLYTIC	CE04W	250V 10.00UFM
C313	5214247991	CAPACITOR,ELECTROLYTIC	CE04W	160V 4.70UFM
C314	5213510091	CAPACTIOR,ELECTROLYTIC	CE04W	35V 10.00UFM
C315	5232710301	CAPACITOR,CERAMIC CK45	E DC	500V10000.00PFP
C316	5213522091	CAPACITOR,ELECTROLYTIC	CE04W	35V 22.00UFM
C317	5213410091	CAPACITOR,ELECTROLYTIC	CE04W	25V 10.00UFM
C318	5213233112	CAPACITOR,ELECTROLYTIC	CE04W	10V 330.00UFM
C319	5247068191	CAPACITOR,CERAMIC CC45	SL DC	50V 680.00PFJ
C320	5213447091	CAPACITOR,ELECTROLYTIC	CE04W	25V 47.00UFM
C323	5213410091	CAPACITOR,ELECTROLYTIC	CE04W	25V 10.00UFM
C401	5213447112	CAPACITOR,ELECTROLYTIC	CE04W	25V 470.00UFM
C402	5227330291	CAPACITOR,POLYPROPYLENE	CQ93T	100V 3000.00PFJ
C403	5221156291	CAPACITOR,POLYESTER	CQ93M	50V 5600.00PFJ
C404	5213601091	CAPACITOR,ELECTROLYTIC	CE04W	50V 1.00UFM
C405,C431	5221110401	CAPACITOR,POLYESTER P=7.5MM	CQ93M	50V 0.10MFJ
C406	5221110391	CAPACITOR,POLYESTER	CQ93M	50V10000.00PFJ
C407	5231310291	CAPACITOR,CERAMIC CK45	B DC	50V 1000.00PFK
C408	5221147291	CAPACITOR,POLYESTER	CQ93M	50V 4700.00PFJ
C409	5247015191	CAPACITOR,CERAMIC CC45	SL DC	50V 150.00PFJ
C410	5221147291	CAPACITOR,POLYESTER	CQ93M	50V 4700.00PFJ
C411	5213322191	CAPACITOR,ELECTROLYTIC	CE04W	16V 220.00UFM

CKT NO.	PART NO.	DESCRIPTION	SPEC
C412	5224422301	CAPACITOR,POLYPROPYLENE P=10MM	CQ93T 250V22000.00PFK
C413	5232310291	CAPACITOR,CERAMIC CK45	B DC 500V 1000.00PFK
C415	5248418100	CAPACITOR,CERAMIC CC45	SL DC 2KV 180.00PFJ
C416	5210502900	CAPACITOR,ELECTROLYTIC NP	CE02W 50V 0.47UFM
C417	5231810391	CAPACITOR,CERAMIC CK45	F DC 50V10000.00PFZ
C418,C419	5223002701	CAPACITOR,POLYPROPYLENE P=15MM	CQ93T 800V15000.00PFJ
C420			
C422	5232310291	CAPACITOR,CERAMIC CK45	B DC 500V 1000.00PFK
C423	5214210012	CAPACITOR,ELECTROLYTIC	CE04W 160V 10.00UFM
C424	5234547201	CAPACITOR,CERAMIC CK45	E DC 2KV 4700.00PFM
C425	5270302501	CAPACITOR,METALLIZED P.P P=15	CF93T 250V 0.22MFJ
C426	5270304501	CAPACITOR,METELLIZED P.P P=15	CF93T 250V 0.33MFJ
C427	5231333291	CAPACITOR,CERAMIC CK45	B DC 50V 3300.00PFK
C431	5236310401	CAPACITOR,BARRIER,LAYER,CG45X	F DC 50V 0.10UFZ
C433	5215347001	CAPACITOR,ELECTROLYTIC (105C)	CE04W 200V 47.00UFM
C437,C441	5222410401	CAPACITOR,POLYESTER P=7.5MM	CQ92M 100V 0.10UFJ
C506	5231847391	CAPACITOR,CERAMIC	50 47n F
C531,C561	5213210191	CAPACITOR,ELECTROLYTIC	10V 10u
C565	5213333112	CAPACITOR,ELECTROLYTIC	16V 330u
C593	5213347091	CAPACITOR,ELECTROLYTIC	16V 47u
C594	5275122401	CAPACITOR,POLYESTER	63V 0.22u 5%
C595	5213347991	CAPACITOR,ELECTROLYTIC	16V 4.7u
RESISTOR			
R201	5142412190	RESISTOR,CARBON FILM	RD S B 1/2W 120.00 J
R202,R205	5142818395	RESISTOR,CARBON FILM	RD S B 1/4W 18.00KJ
R203,R204	5142833195	RESISTOR,CARBON FILM	RD S B 1/4W 330.00 J
R206	5142824295	RESISTOR,CARBON FILM	RD S B 1/4W 2.40KJ
R207,R208	5162163720	RESISTOR,VR PN06FB105AR	F5X5 B 1.00MOHM
R211	5162172810	RESISTOR,VR PN08TB104AR	TM5X5 B 100.00KOHM
R219,R220 R239,R243	5142810295	RESISTOR,CARBON FILM	RD S B 1/4W 1.00KJ
R221,R228 R230,R231,R303	5142810395	RESISTOR,CARBON FILM	RD S B 1/4W 10.00KJ
R225	5142882395	RESISTOR,CARBON FILM	RD S B 1/4W 82.00KJ
R226,R232 R234,R301	5142847295	RESISTOR,CARBON FILM	RD S B 1/4W 4.70KJ
R227	5142839295	RESISTOR,CARBON FILM	1/4W 3.9KOHM
R229	5142812495	RESISTOR,CARBON FILM	RD S B 1/4W 120.00KJ
R233	5142847495	RESISTOR,CARBON FILM	RD S B 1/4W 470.00KJ
R235	5162161720	RESISTOR,VR PN06FB502AR	F5X5 B 5.00KOHM
R236	5142839195	RESISTOR,CARBON FILM	RD S B 1/4W 390.00 J
R237	5142822295	RESISTOR,CARBON FILM	RD S B 1/4W 2.20KJ
R238	5142833195	RESISTOR,CARBON FILM	RD S B 1/4W 330.00 J
R240	5142875395	RESISTOR,CARBON FILM	RD S B 1/4W 75.00KJ
R241	5160806137	RESISTOR,VR RV12TB105HKFR	V012LPHJ-36U-B105
R241A	5142843495	RESISTOR,CARBON FILM	RD S B 1/4W 430.00KJ
R304	5142833495	RESISTOR,CARBON FILM	RD S B 1/4W 330.00KJ
R305,RE804	5142868495	RESISTOR,CARBON FILM	RD S B 1/4W 680.00KJ
R307	5142820295	RESISTOR,CARBON FILM	RD S B 1/4W 2.00KJ
R308	5142812195	RESISTOR,CARBON FILM	RD S B 1/4W 120.00 J
R309	5142822995	RESISTOR,CARBON FILM	RD S B 1/4W 2.20 J
R310	5142851295	RESISTOR,CARBON FILM	RD S B 1/4W 5.10KJ
R312	5142401090	RESISTOR,CARBON FILM	RD S B 1/2W 1.00 J
R315	5162173710	RESISTOR,VR PN08TB105AR	TM5X5 B 1.00MOHM
R316	5162172810	RESISTOR,VR PN08TB104AR	TM5X5 B 100.00KOHM

CKT NO.	PART NO.	DESCRIPTION	SPEC
R317	5130315104	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 150.00 J
R318	5130310204	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 1.00KJ
R320	5133222907	RESISTOR,FUSIBLE	RNF 14A 1W 2.20 J
R326	5142430290	RESISTOR,CARBON FILM	RD S B 1/2W 3.00KJ
R327	5162171710	RESISTOR,VR PN08TB502AR	TM5X5 B 5.00KOHM
R328	5162171910	RESISTOR,VR PN08TB103AR	TM5X5 B 10.00KOHM
R329	5142810295	RESISTOR,CARBON FILM	RD S B 1/4W 1.00KJ
R330,R331 R450	5142833395	RESISTOR,CARBON FILM	RD S B 1/4W 33.00KJ
R332	5142847095	RESISTOR,CARBON FILM	RD S B 1/4W 47.00 J
R333,R334 RE806	5142847295	RESISTOR,CARBON FILM	RD S B 1/4W 4.70KJ
R335	5142843295	RESISTOR,CARBON FILM	RD S B 1/4W 4.30KJ
R336	5142412190	RESISTOR,CARBON FILM	RD S B 1/2W 120.00 J
R337	5142415190	RESISTOR,CARBON FILM	RD S B 1/2W 150.00 J
R338	5160806117	VR,RV12TB502HKFR	0.15W B 5.00KOHM
R338A	5130330104	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 300.00 J
R339,R408	5142810295	RESISTOR,CARBON FILM	RD S B 1/4W 1.00KJ
R340	5142811495	RESISTOR,CARBON FILM	RD S B 1/4W 110.00KJ
R342	5142868295	RESISTOR,CARBON FILM	RD S B 1/4W 6.80KJ
R343	5162162220	RESISTOR,VR PN06FB223AR	F5X5 B 22.00KOHM
R401,R461	5142482190	RESISTOR,CARBON FILM	RD S B 1/2W 820.00 J
R402	5142830295	RESISTOR,CARBON FILM	RD S B 1/4W 3.00KJ
R403	5142824295	RESISTOR,CARBON FILM	RD S B 1/4W 2.40KJ
R404	5142812395	RESISTOR,CARBON FILM	RD S B 1/4W 12.00KJ
R405	5162161720	RESISTOR,VR PN06FB502AR	F5X5 B 5.00KOHM
R406	5142868395	RESISTOR,CARBON FILM	RD S B 1/4W 68.00KJ
R407	5142810395	RESISTOR,CARBON FILM	RD S B 1/4W 10.00KJ
R409,R410 RE803	5142422290	RESISTOR,CARBON FILM	RD S B 1/2W 2.20K
R411	5160807717	RESISTOR,VR RV09FB502EKER	RK09K1130345-TT B5K M
R412	5142810195	RESISTOR,CARBON FILM	RD S B 1/4W 100.00 J
R413,R414	5142412190	RESISTOR,CARBON FILM	RD S B 1/2W 120.00 J
R416	5130468204	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 2W 6.80KJ
R417	5142433290	RESISTOR,CARBON FILM	RD S B 1/2W 3.30KJ
R420	5130382104	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 820.00 J
R422	5162161720	RESISTOR,VR PN06FB502AR	F5X5 B 5.00KOHM
R423	5160807717	RESISTOR,VR RV09FB502EKER	RK09K1130345-TT B5K
R427	5142843395	RESISTOR,CARBON FILM	RD S B 1/4W 43.00KJ
R435	5142447090	RESISTOR,CARBON FILM	RD S B 1/2W 47.00 J
R439,R440	5142820295	RESISTOR,CARBON FILM	RD S B 1/4W 2.00KJ
R441	5142816495	RESISTOR,CARBON FILM	RD S B 1/4W 160.00KJ
R442	5142856395	RESISTOR,CARBON FILM	RD S B 1/4W 56.00KJ
R443	5162172810	RESISTOR,VR PN08TB104AR	TM5X5 B 100.00KOHM
R445	5142811395	RESISTOR,CARBON FILM	RD S B 1/4W 11.00KJ
R448	5162907544	RESISTOR,VR PN09FB475DR	0.5W 1000V B 4.70M OHM
R449,R451	5136022595	RESISTOR METAL GLAZE FILM	RS 08 B 1/4W 2.20MJ
R460	5142820395	RESISTOR,CARBON FILM	RD S B 1/4W 20.00KJ
R462	5142851195	RESISTOR,CARBON FILM	RD S B 1/4W 510.00 J
RE805	5130313307	RESISTOR,METAL OXIDE FLIM,MINI	RS 08 B 1W 13.00KJ
RE807	5142818295	RESISTOR,CARBON FILM	RD S B 1/4W 1.80KJ
RE808	5142816295	RESISTOR,CARBON FILM	RD S B 1/4W 1.60KJ
RE810	5160807717	RESISTOR,VR RV09FB502EKER	RK09K1130345-TT B5K M

CKT NO.	PART NO.	DESCRIPTION	SPEC	
SEMICONDUCTORS				
D201,D202	6613001730	DIODE SWITCHING	HIT IS2076 30V 150MA T=26MM	.1
D204,D205				
D208,D308	6613001730	DIODE SWITCHING	HIT IS2076 30V 150MA T=26MM	.1
RA				
D201,D202	6612006030	DIODE DETECTOR	TSB 1S1555-TP3 35V 0.1A T=26MM	
D204,D205,D208,D308 RB				
D210	6615012234	DIODE ZENER	TSB 05AZ5.1Y 4.81V-5.17V T=26MM	
D235 RA	6615010633	DIODE ZENER	TSB 05AZ12X 11.08V-11.67V T=26MM	
D235 RB	6615010635	DIODE ZENER	05A12Z	
D301	6611013242	DIODE RECTIFIER	GIT GP15D 200V 1.5A T=52MM	
D303 RA	6613002245	DIODE SWITCHING	GIT RGP10G 400V 1A F T=52MM	.1
D303 RB	6613002242	DIODE SWITCHING	HIT V09E 400V 1A F T=52MM	
D305	6615007930	DIODE ZENER	HIT HZ11A2 9.7-10.1V T=26MM	
D306,D307	6613003032	DIODE SWITCHING	HIT 1N4148 75V 150MA T=26MM	
D401 RA	6615014130	DIODE ZENER	SYO GZA9.1X 8.6-9V T=52MM	
D405 RA	6613002244	DIODE SWITCHING	GIT RGP10D 200V 1A T=52MM	
D405 RB	6613002243	DIODE SWITCHING	HIT V09C 200V 1A F T=52MM	
DE801	6611013242	DIODE RECTIFIER	GIT GP15D 200V 1.5A T=52MM	
Q201 RA	6646009922	IC,DIGITAL	HIT HD74LS86	
Q201 RB	6646009923	IC DIGITAL	GS GD74LS86 QUAD EOR GATE	
Q203	6645009002	IC, DIGITAL MOS	HIT HD14053BP	
Q208 RA	6646010300	IC DIGITAL	NS DM74LS138 3TO8 DECODER/DEMUL	
Q208 RB	6646010310	IC,DIGITAL	MOT SN74LS138 3TO8 DECODER	
Q209,Q210	6621015332	TR NPN HF	TSB 2SC1815Y TPE2 TAPING	
Q214,Q207				
Q211	6644060100	IC LINEAR	SHP IR9331	
Q212	6644060000	IC LINEAR	NEC UPC4557C	
Q213,Q206	6645009002	IC, DIGITAL MOS	HIT HD14053BP	
Q207				
Q301	6644045200	IC,LINEAR	SGS TDA1670A(GL1211)	
Q303 RA	6623006330	TR PNP HF	TSB 2SA966-Y-TPE6	
Q303 RB	6624007530	TR PNP LF	HIT 2SB739-C TAPING	
Q401 RA	6622013330	TR NPN	2SD667C	
Q401 RB	6622014030	TR NPN LF	HIT 2SD669AC TAPING	
Q402 RA	6644032900	IC,LINEAR	MOT MC1391P HOR.PROCESSOR	
Q402 RB	6644011303	IC LINEAR	NS LM1391N	
Q402 RC	6644011302	IC LINEAR	RCA CA1391E	
Q403	6621028400	TR NPN HF	HIT 2SC3883	
COILS AND TRANSFORMERS				
L401	5062104700	COIL,CHOKE (LINE)	CHK-117 18UHJ	
L402	5062205300	COIL,WIDTH TWH-137	CENTER=80UH	
L403	5062221400	COIL,HOR LINEARITY	TLH-214	
L404	5062110300	COIL CHOKE	CHK-311	
T401	5062412901	TRANS HOR DRIVE TLN-129A	100MH/200UH 22.5/1	
T402	5062802200	TRANS,SIDE PIN CUSHION	TPC-0022 LH=48.5UH	
T403 RA	5062621802	TRANS,FLYBACK COLOR	TFB-218B HV=22.5KV B+=110V	
T403 RB	5062621803	TRANS,FLYBACK,COLOR	TFB-218C (HITACHI)	

CKT NO.	PART NO.	DESCRIPTION	SPEC

ASSEMBLY,PCB-CRT, PWB-1299B-04

CAPACITOR

C501,C531 C561	5213210191	CAPACITOR,ELECTROLYTIC	CE04W	10V	100.00UFM
C502,C532 C562	5231810391	CAPACITOR,CERAMIC CK45	F DC	50V	10000.00PFZ
C503,C533 C563	5231810391	CAPACITOR,CERAMIC CK45	F DC	50V	10000.00PFZ
C504,C534 C564	5213622991	CAPACTIOR,ELECTROLYTIC	CE04W	50V	2.20UFM
C505,C535 C565,C593	5213447091	CAPACITOR,ELECTROLYTIC	CE04W	25V	47.00UFM
C506,C536 C566,C591	5231810391	CAPACITOR,CERAMIC CK45	F DC	50V	10000.00PFZ
C593	5213347091	CAPACITOR,ELECTROLYTIC	CE04W	16V	47.00UFM
C594	5275122401	CAPACITOR,METALLIZED,P.E P=5MM	CF93M	63V	0.22MFJ
C595	5213347991	CAPACITOR,ELECTROLYTIC	CE04W	16V	4.70UFM
C596	5213433112	CAPACITOR,ELECTROLYTIC	CE04W	25V	330.00UFM
C901	5247022191	CAPACITOR,CERAMIC CC45	SL DC	50V	220.00PFJ
C902,C932 C962	5214247991	CAPACITOR,ELECTROLYTIC	CE04W	160V	4.70UFM
C903,C933 C963	5270302501	CAPACITOR,METALLIZED P.P P=15	CF93T	250V	0.22MFJ
C931,C961	5247015191	CAPACITOR,CERAMIC CC45	SL DC	50V	150.00PFJ
C991	5233310201	CAPACITOR,CERAMIC CK45	B DC	1KV	1000.00PFK
C992	5234333101	CAPACITOR,CERAMIC CK45	B DC	2KV	330.00PFK
C993	5214410012	CAPACITOR,ELECTROLYTIC	CE04W	250V	10.00UFM

RESISTOR

R210,R212 R213	5142810295	RESISTOR,CARBON FILM	RD S B 1/4W	1.00KJ
R211	5142820395	RESISTOR,CARBON FILM	RD S B 1/4W	20.00KJ
R214,R215 R216	5142111295	RESISTOR,CARBON FILM	RD S B 1/6W	1.10KJ
R501,R531 R561	5142875095	RESISTOR,CARBON FILM	RD S B 1/4W	75.00 J
R502,R532 R562	5162172210	RESISTOR,VR PN08TB223AR	TM5X5 B	22.00KOHM
R503,R533 R563	5142862295	RESISTOR,CARBON FILM	RD S B 1/4W	6.20KJ
R505,R535 R565	5142882395	RESISTOR,CARBON FILM	RD S B 1/4W	82.00KJ
R585	5142827295	RESISTOR,CARBON FILM	RD S B 1/4W	2.7K J
R586,R599	5142851295	RESISTOR,CARBON FILM	RD S B 1/4W	5.10KJ
R587	5142813395	RESISTOR,CARBON FILM	RD S B 1/4W	13.00KJ
R588	5142891195	RESISTOR,CARBON FILM	RD S B 1/4W	910.00 J
R589	5142813295	RESISTOR,CARBON FILM	RD S B 1/4W	1.30KJ
R594	5142822395	RESISTOR,CARBON FILM	RD S B 1/4W	22.00KJ
R595	5142810195	RESISTOR,CARBON FILM	RD S B 1/4W	100.00 J
R596	5142810395	RESISTOR,CARBON FILM	RD S B 1/4W	10.00KJ
R597	5142847395	RESISTOR,CARBON FILM	RD S B 1/4W	47.00KJ
R598	5142830295	RESISTOR,CARBON FILM	RD S B 1/4W	3.00KJ
R901,R931	5142882095	RESISTOR,CARBON FILM	RD S B 1/4W	82.00 J

CKT NO.	PART NO.	DESCRIPTION	SPEC
R961			
R902,R932	5142833095	RESISTOR,CARBON FILM	RD S B 1/4W 33.00 J
R962			
R903,R933	5142868195	RESISTOR,CARBON FILM	RD S B 1/4W 680.00 J
R963			
R904,R934	5142847195	RESISTOR,CARBON FILM	RD S B 1/4W 470.00 J
R964			
R905,R935	5111210190	RESISTOR,CARBON COMPOSITION	RC GE 1/2W 100.00 J
R965			
R906,R936	5130715200	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 5W 1.50KJ
R966			
R907,R937	5142822195	RESISTOR,CARBON FILM	RD S B 1/4W 220.00 J
R967			
R908,R938	5130310307	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 10.00KJ
R968			
R909,R939	5142810195	RESISTOR,CARBON FILM	RD S B 1/4W 100.00 J
R969			
R910,R940	5162171910	RESISTOR,VR PN08TB103AR	TM5X5 B 10.00KOHM M
R970			
R911,R941	5142843195	RESISTOR,CARBON FILM	RD S B 1/4W 430.00 J
R971			
R912,R942	5142843095	RESISTOR,CARBON FILM	RD S B 1/4W 43.00 J
R972			
R991	511123490	RESISTOR,CARBON FILM	1/2W 330OHM
R992	5111233490	RESISTOR,CARBON COMPOSITION	RC GE 1/2W 330.00KJ
MISCELLANEOUS			
S901,S931	5202201991	SPARK GAP MITSUBISHI	DC200V 1PF DSP-201M-C04F
S961,S991			
		ASSEMBLY,PCB-POWER, PWB-1345A	
CAPACITOR			
C803	5215310101	CAPACITOR,ELECTROLYTIC (105C)	CE04W 16V 100.00MFM
C804	5215347101	CAPACITOR,ELECTROLYTIC (105C)	CE04W 16V 470.00MFM
C805,C820	5215310101	CAPACITOR,ELECTROLYTIC (105C)	CE04W 16V 100.00MFM
C806	5247047191	CAPACITOR,CERAMIC CC45	SL DC 50V 470.00PFJ
C807	5231322291	CAPACITOR,CERAMIC CK45	B DC 50V 2200.00PFK
C808	5221182291	CAPACITOR,POLYESTER	CQ93M 50V 8200.00PFJ
C810	5271115401	CAPACITOR,METALLIZED P.E P=10	CF93M 100V 0.15MFJ
C811	5272110401	CAPACITOR,METALLIZED P.E P=10	CF93M 250V 0.10MFJ
C813	5221110391	CAPACITOR,POLYESTER	CQ93M 50V10000.00PFJ
C814	5223647301	CAPACITOR,POLYPROPYLENE P=15MM	CQ93T 630V47000.00PFJ
C815	5234310201	CAPACITOR,CERAMIC CK45	B DC 2KV 1000.00PFK
C817,C818	5210308000	CAPACITOR,ELECTROLYTIC (105C)	CEL1W 250V 220.00UFM
C821,C840	5232310291	CAPACITOR,CERAMIC CK45	B DC 500V 1000.00PFK
C845			
C824,C825	5232347201	CAPACITOR,CERAMIC CK45	B DC 500V 4700.00PFK
C831,C835	5232333191	CAPACITOR,CERAMIC CK45	B DC 500V 330.00PFK
C850			
C832	5210403501	CAPACITOR,ELECTROLYTIC	CE04C 35V 1000.00UFM
C836	5215410212	CAPACITOR,ELECTROLYTIC (105C)	CE04W 25V 1000.00MFM
C841	5216210101	CAPACITOR,ELECTROLYTIC (105C)	CE04W 160V 100.00UFM
C843	5214410012	CAPACITOR,ELECTROLYTIC	CE04W 250V 10.00UFM
C846	5216347001	CAPACITOR,ELECTROLYTIC (105C)	CE04W 200V 47.00UFM
C851	5215347101	CAPACITOR,ELECTROLYTIC (105C)	CE04W 16V 470.00MFM

CKT NO.	PART NO.	DESCRIPTION	SPEC
RESISTOR			
R801 RA	5101106800	POWER THERMISTOR	SEMITEC 5D-11 50HM B=3250
R801 RB	5101106201	SURGE-GARD	SG-220
R802	5150107301	RESISTOR,CEMENT (H<40MM)	RW 98 10W 5.00KJST
R803	5101106900	POSISTOR,PTH451C02BG200N270	C 20.00 N 200V MURATA
R804	5142812995	RESISTOR,CARBOW FILM	RD S B 1/4W 1.20 J
R805	5140039490	RESISTOR,CARBON FILM	RD S B 1W 390.00KJ
R806	5142810195	RESISTOR,CARBON FILM	RD S B 1/4W 100.00 J
R807	5142812295	RESISTOR,CARBON FILM	RD S B 1/4W 1.20KJ
R808	5140012490	RESISTOR,CARBON FILM	RD S B 1W 120.00KJ
R810	5140015490	RESISTOR,CARBON FILM	RD S B 1W 150.00KJ
R811	5142827095	RESISTOR,CARBON FILM	RD S B 1/4W 27.00 J
R812,R814 R820	5142882295	RESISTOR,CARBON FILM	RD S B 1/4W 8.20KJ
R813	5162101920	RESISTOR,VR RV08FB103AR	1/4 W B 10 KOHM
R815	5150107302	RESISTOR,CEMENT (H<40MM)	RW 98 10W 45.00KJST
R816	5130410107	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 2W 100.00 J
R817 RA	5130315404	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 150.00KJ
R817 RB	5142515401	RESISTOR,CARBON FILM	RD S B 1W 150.00KJ
R818	5142818295	RESISTOR,CARBON FILM	RD S B 1/4W 1.80KJ
R819	5142824195	RESISTOR,CARBON FILM	RD S B 1/4W 240.00 J
R821,R822	5142822495	RESISTOR,CARBON FILM	RD S B 1/4W 220.00KJ
R823	5142801095	RESISTOR,CARBON FILM	RD S B 1/4W 1.00 J
SEMICONDUCTORS			
D801 RA	6611024700	DIODE RECTIFIER BRIDGE	GIT KBL06 400V 4A
D801 RB	6611024701	DIODE RECTIFIER	REC RS405L 600V 4A
D805 RA	6611012741	DIODE RECTIFIER	HIT V19G 600V 0.2A T=52MM
D805 RB	6613002246	DIODE SWITCHING	GIT RGP10J 600V 1A F T=52MM
D806,D807 D808,D811 RA	6613002242	DIODE SWITCHING	HIT V09E 400V 1A F T=52MM
D806,D807 D808,D811 RB	6613002245	DIODE SWITCHING	GIT RGP10G 400V 1A F T=52MM
D810	6611012844	DIODE RECTIFIER	FAG BA159 1000V 1A TAPING 52MM
D812 RA	6611012741	DIODE RECTIFIER	HIT V19G 600V 0.2A T=52MM
D812 RB	6613002246	DIODE SWITCHING	GIT RGP10J 600V 1A F T=52MM
D820,D821 D824,D826	6611013006	DIODE RECTIFIER	GIT RGP15G 400V 1.5A
D822,D823	6611013043	DIODE RECTIFIER	GIT RGP15J 600V 1.5A T=52MM
D827	6611013006	DIODE RECTIFIER	GIT RGP15G 400V 1.5A
IC801 RA	6644058800	IC LINEAR	SIE TDA4601
IC801 RB	6644058801	IC LINEAR	SGS TDA-4601
Q801	6621030800	TR NPN HF	SYO 2SC3461-L
Q802	6621019101	TR NPN HF	TSB 2SC2482
Q803 RA	6631001800	SCR	CW-12B 100V 0.3A
Q803 RB	6631001731	THYRISTOR SCR	TSB SFOR1B42 (IG1) TAPING
COILS AND TRANSFORMERS			
L801	5061106600	CORE,BEAD INDUCTOR	TOKIN B01-AT1F
L802	5062102400	COIL, CHOKE	TRF-9229
L833,L837 L842,L847	5062217000	COIL,LOSS TSH-170	L=140UH
T801	5061346400	SWITCHING JRANSFORMER	TPW-464,UL/CSA/TUV

CKT NO.	PART NO.	DESCRIPTION	SPEC
		ASSEMBLY,PWB-LINE FILTER, PWB-1428	
CAPACITOR			
C827,C828	5270101501	CAPACITOR,METALLIZED P.EP=27.5	CF99MAC250V 0.47MFM
C829,C830	5230101800	CAPACITOR,CERAMIC CK45 (KC)	F AC 400V 2200.00PFM
RESISTOR			
R826	5142830495	RESISTOR,CARBON FILM	RD S B 1/4W 300.00KJ
COILS AND TRANSFORMERS			
L804	5061102201	LINE FILTER	TLF-011 27MH
MISCELLANEOUS			
F801	5054410501	FUSE FUS-152 UL/CSA	250V 2.5 A TL
POWER CORD			
P807	5097605900	POWER CORD	
		ASSEMBLY,PCB-LED, PWB-1338-002	
RESISTOR			
R756	5145810290	RESISTOR,CARBON FILM	RD U B 1/4W 1.00KJ
MISCELLANEOUS			
G701	6618014200	DIODE LED	SE6322AK/LT2022E-11 GREN 2X5MM
		ASSEMBLY,VERTICAL SIZE CTL, PWB-1627	
CAPACITOR			
C321	5275122491	CAPACITOR,METALLIZED P.E	CF93M 63V 0.22MFJ
C322	5213347991	CAPACITOR,ELECTROLYTIC	CE04W 16V 4.70UFM
RESISTOR			
R344	5130315104	RESISTOR,METAL OXIDE FILM,MINI	RS 08 B 1W 150.00 J
R345	5142816495	RESISTOR,CARBON FILM	RD S B 1/4W 160.00KJ
R346	5142856395	RESISTOR,CARBON FILM	RD S B 1/4W 56.00KJ
R347	5142830395	RESISTOR,CARBON FILM	RD S B 1/4W 30.00KJ
R348	5142822195	RESISTOR,CARBON FILM	RD S B 1/4W 220.00 J
R349	5142815495	RESISTOR,CARBON FILM	RD S B 1/4W 150.00KJ
R350	5142810295	RESISTOR,CARBON FILM	RD S B 1/4W 1.00KJ
R351	5142820295	RESISTOR,CARBON FILM	RD S B 1/4W 2.00KJ
SEMICONDUCTORS			
D311	6615012234	DIODE ZENER	TSB 05AZ5.1Y 4.81V-5.17V T=26MM
D312	6613001730	DIODE SWITCHING	HIT IS2076 30V 150MA T=26MM
Q304	6646007018	IC,DIGITAL	HIT 74LS123P
Q305	6621003230	TR NPN HF	HIT 2SC458-C TAPING

CKT NO.	PART NO.	DESCRIPTION	SPEC
		ASSEMBLY,CONTROL(VR), CM1498X-U01	
RESISTOR			
R444	5160806226	VR,RV16NB503EKER-CC	1/10W B 50.00KOHM
R590	5161161714	RESISTOR,VARIABLE RV16NB502EK	1/5 W B 5 KOHM
MISCELLANEOUS			
S801	5054519600	SWITCH SEE-SAW AC250V TV5	FD SDDTA3007U-TT/ALPS SDDTA3
		ASSEMBLY,SIGNAL CABLE	
P505	5057404226	ASSEM. CABLE	
		ASSEMBLY,CRT, CM1498X-U02	
COILS AND TRANSFORMERS			
L991	5060117901	COIL,DEGAUSSING	TSB-179A R=25 OHM L=320MM
MISCELLANEOUS			
V901 RA	5051224306	CCRT/DY (CM-1496X)	M34JOU30X95
V901 RB	5051225900	CCRT/DY (CM-1496X)	E8034B22-TC13ETHT
V901 RA	5051224304	CCRT/DY (CM-1498X)	M34KFT03XE14
V901 RB	5051224305	CCRT/DY (CM-1498X)	E8032B22-TC100THT

10.CIRCUIT DIAGRAM

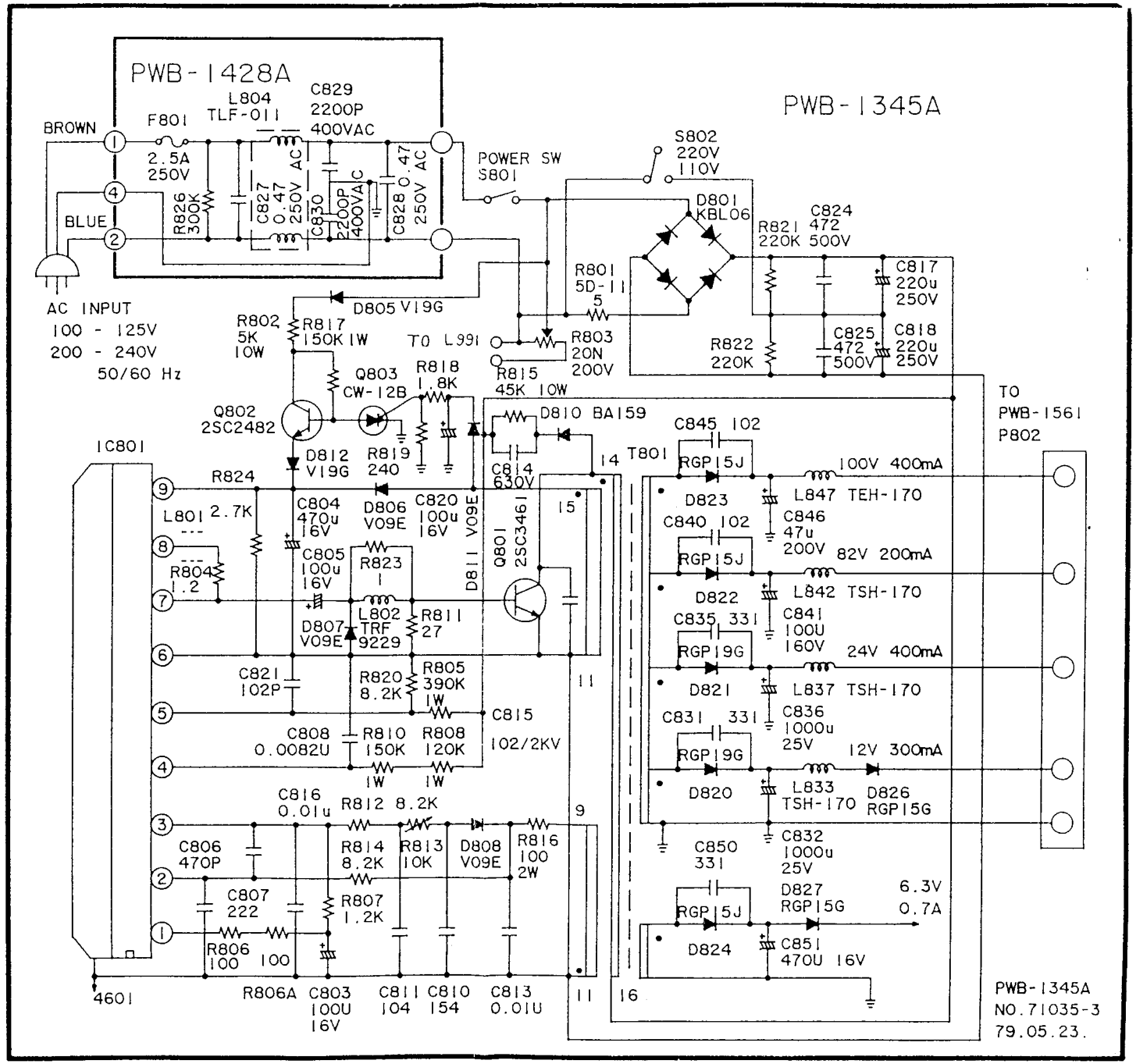


Fig 9-2 S.M.P.S CIRCUIT BOARD LAYOUT

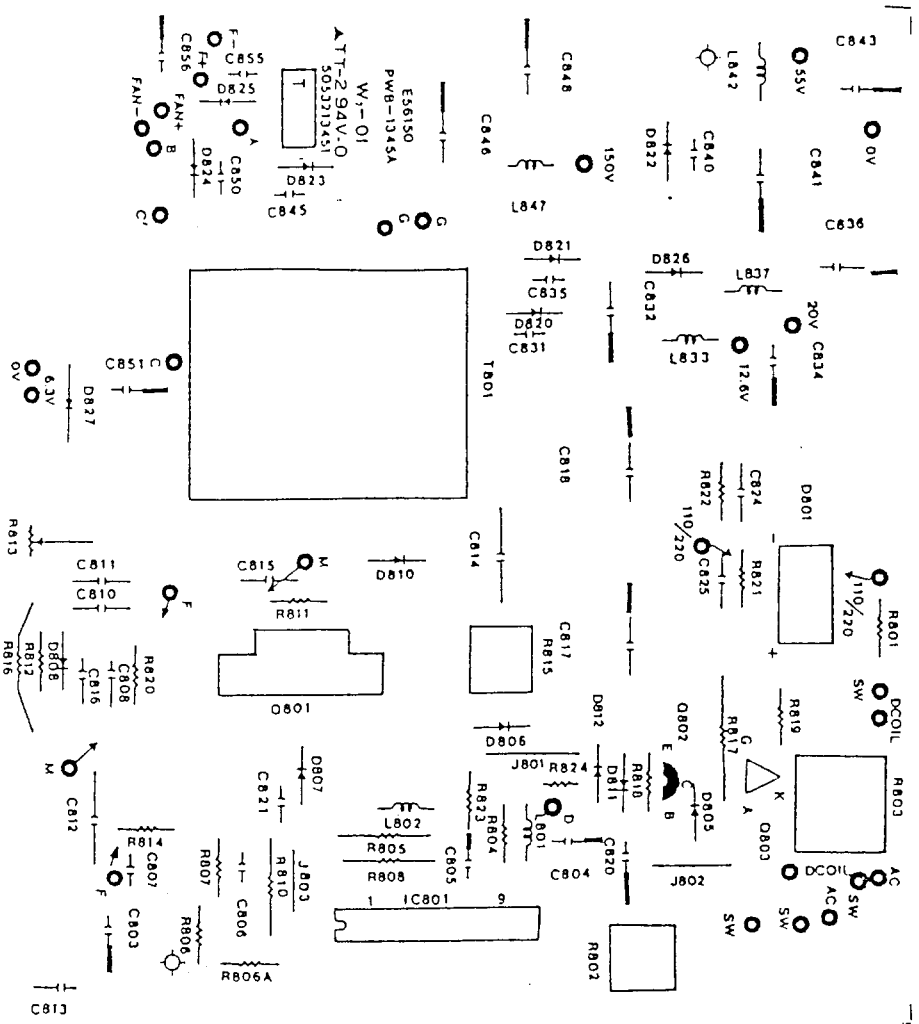


Fig 9-3 CRT DRIVE BOARD LAYOUT

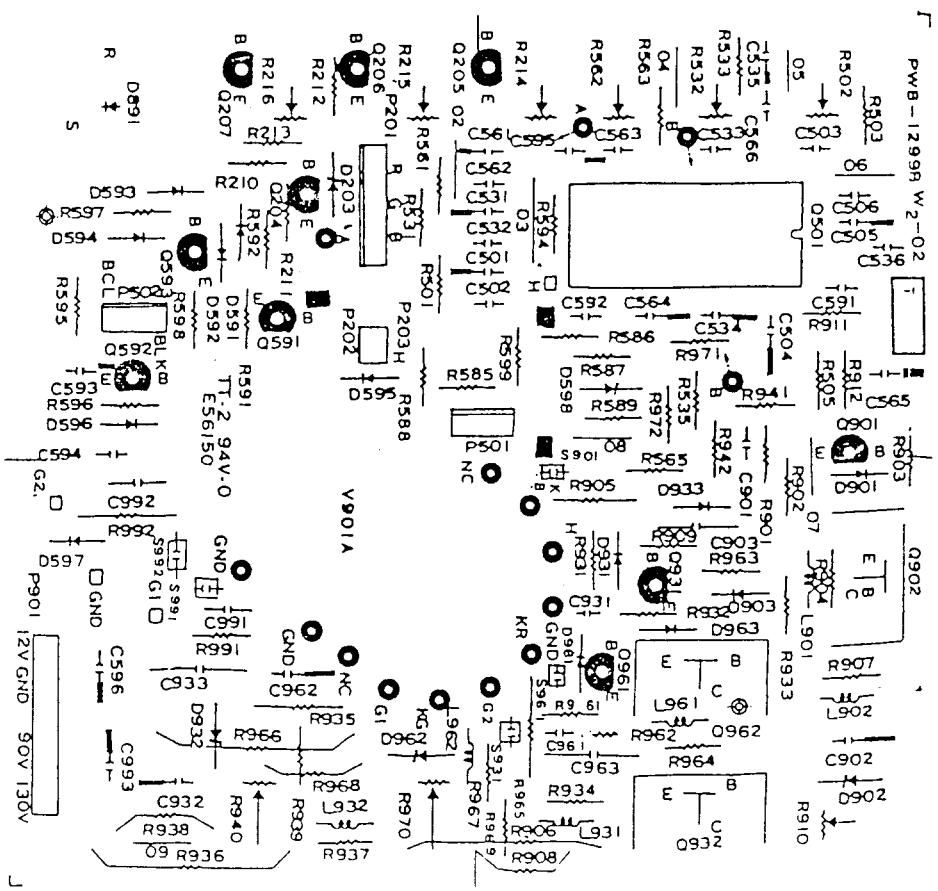


Fig 9-4 LINE FILTER CIRCUIT BOARD LAYOUT

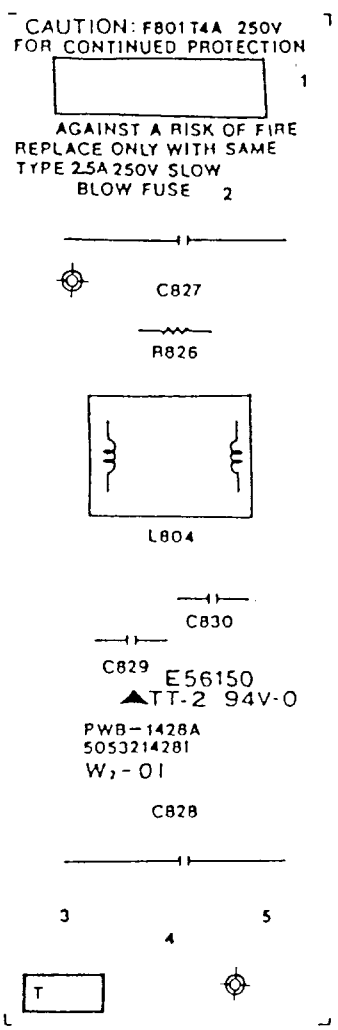
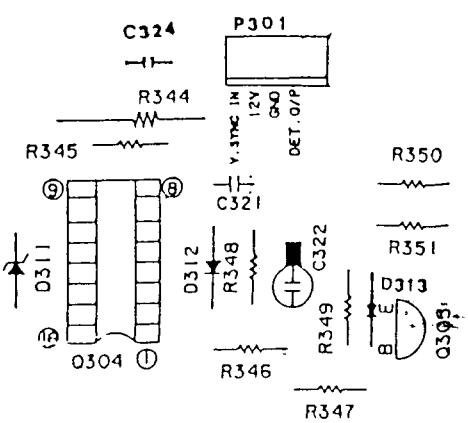
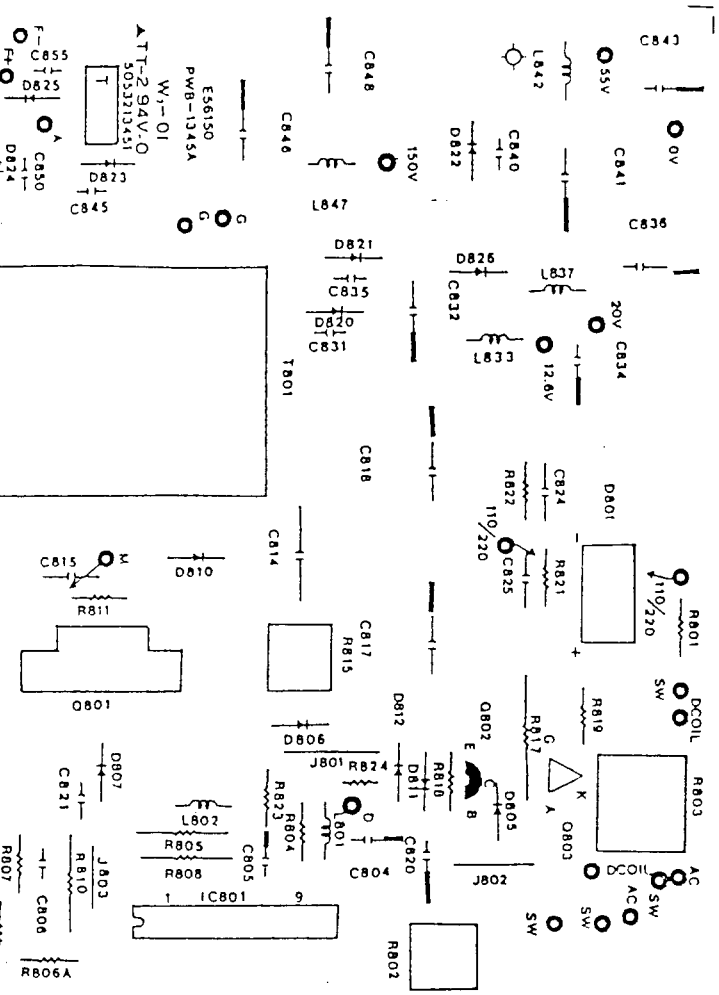


Fig 9-5 VERTICAL SIZE CTL CIRCUIT BOARD LAYOUT



LS CIRCUIT BOARD LAYOUT



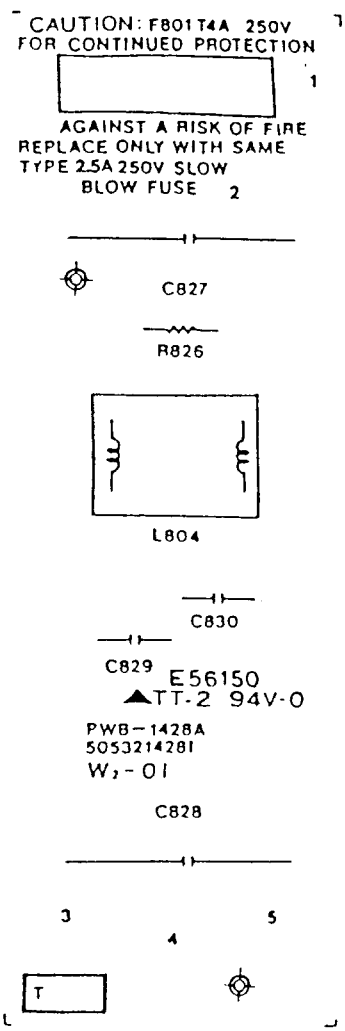


Fig 9-4 LINE FILTER CIRCUIT BOARD LAYOUT

VE BOARD LAYOUT

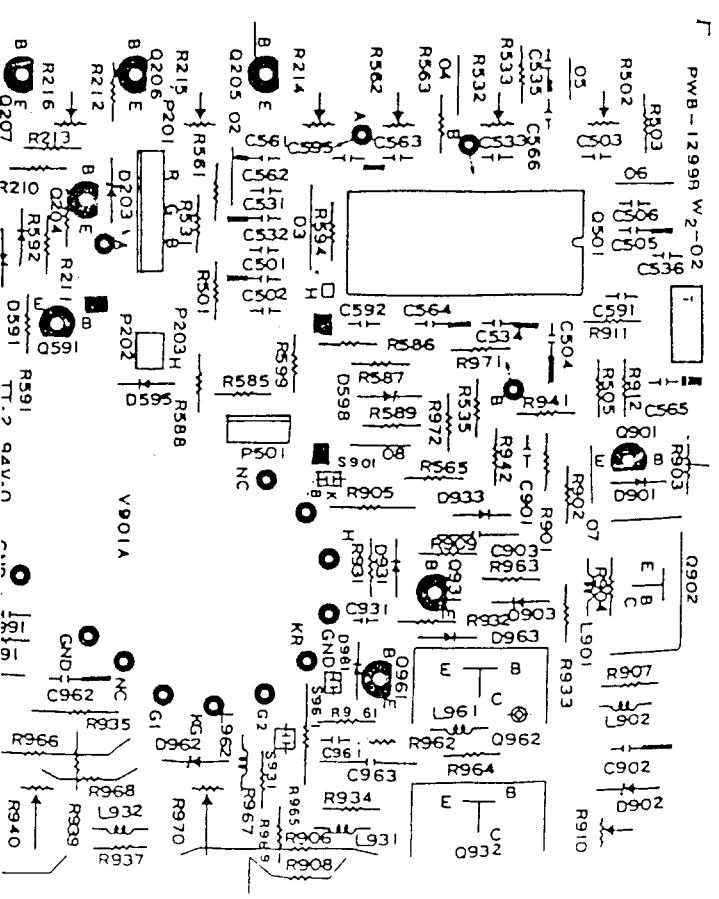
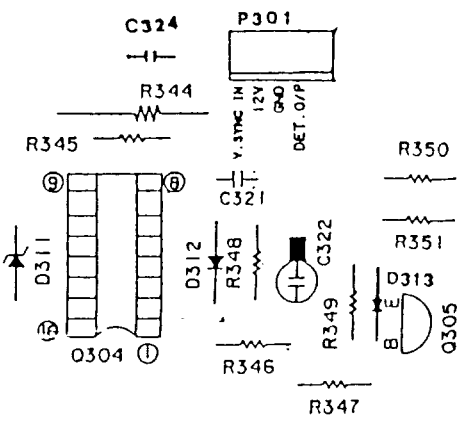


Fig 9-5 VERTICAL SIZE CTL CIRCUIT BOARD LAYOUT



9.CIRCUIT BOARD LAYOUTS

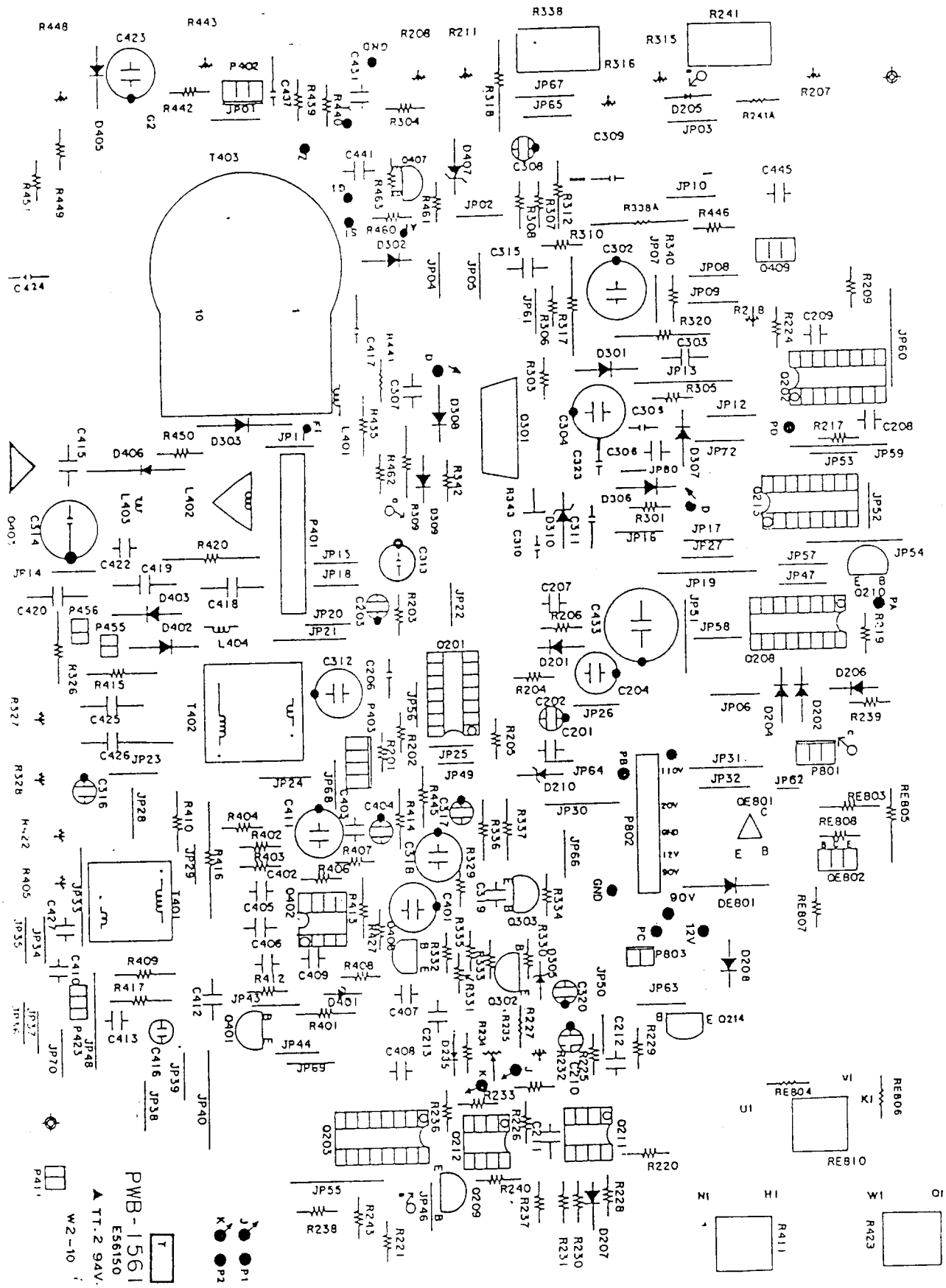
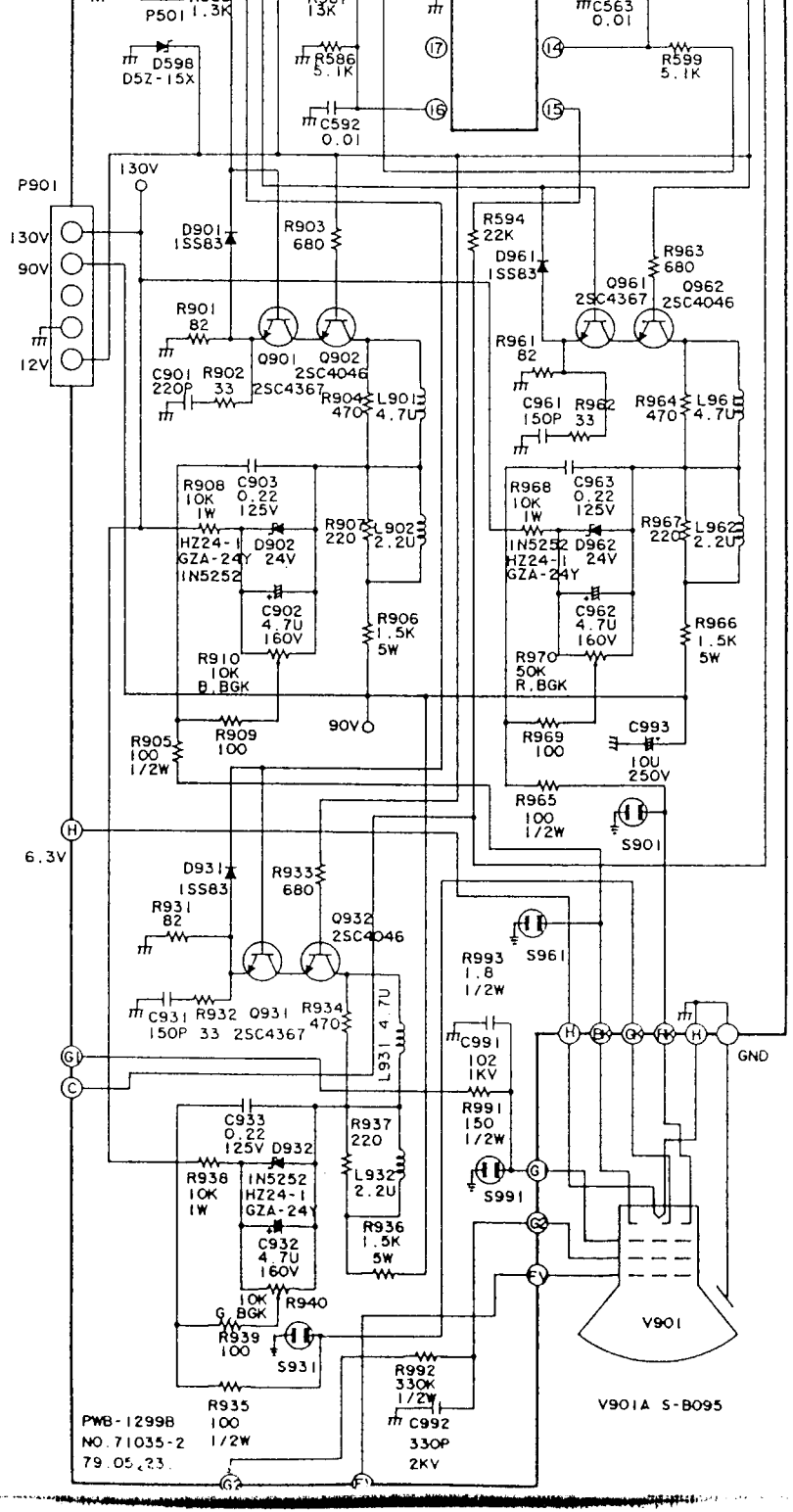
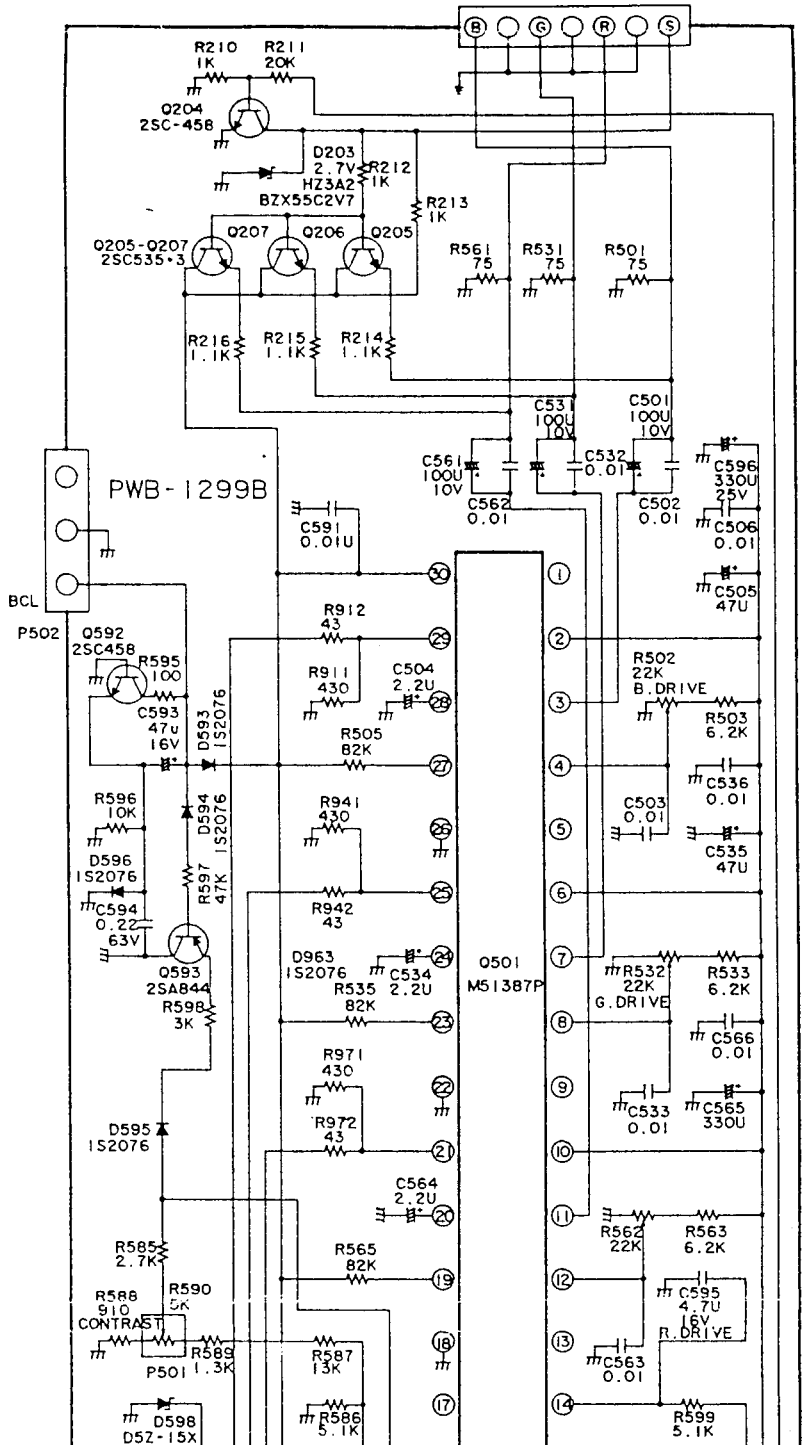
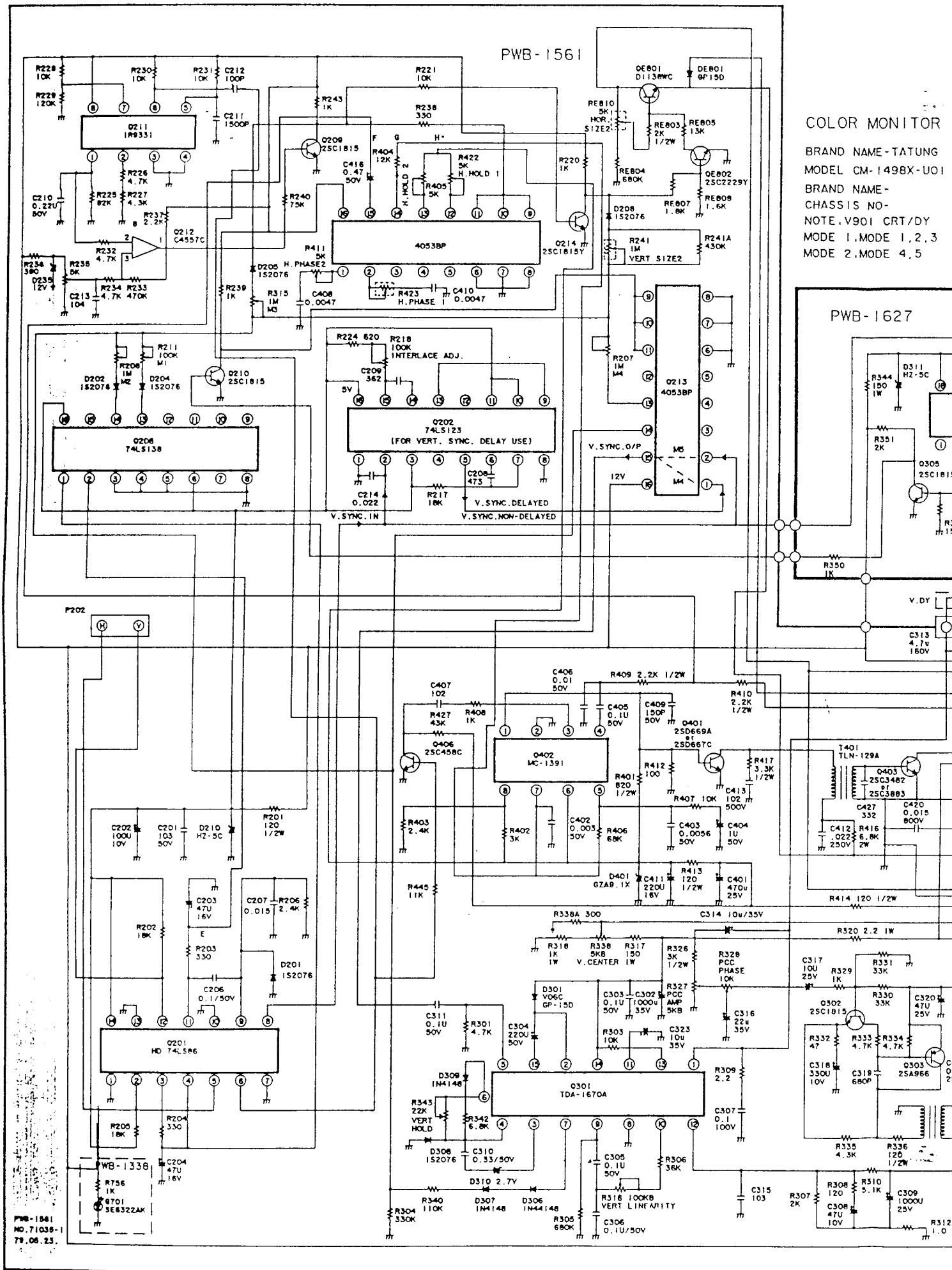


Fig 9-1 MAIN CIRCUIT BOARD LAYOUT


P501 1.3K
D598 D5Z-15X
R586 5.1K
C592 0.01
C563 0.01
R599 5.1K
P901
130V
90V
12V
D901 1SS83
R903 680
R901 82
C901 220P
R902 33
Q901 2SC4367
Q902 2SC4046
R904 470
L901 4.7U
R908 10K 1W
C903 0.22 125V
HZ24-1 GZA-24Y IN5252
D902 24V
R907 220
L902 2.2U
C902 4.7U 160V
R906 1.5K 5W
R910 10K B.BGK
R909 100
R905 100 1/2W
90V
R594 22K
D961 1SS83
R963 680
Q961 2SC4367
Q962 2SC4046
R961 82
C961 150P
R962 33
R964 470
L961 4.7U
R968 10K 1W
C963 0.22 125V
IN5252 HZ24-1 GZA-24Y
D962 24V
R967 220
L962 2.2U
C962 4.7U 160V
R966 1.5K 5W
R970 50K R.BGK
R969 100
C993 10U 250V
R965 100 1/2W
S901
6.3V
D931 1SS83
R933 680
R931 82
Q931 2SC4367
Q932 2SC4046
C931 150P
R932 33
R934 470
L931 4.7U
S961
R993 1.8 1/2W
C991 102 1KV
R991 150 1/2W
S991
GND
C933 0.22 125V
D932 IN5252 HZ24-1 GZA-24Y
R938 10K 1W
C932 4.7U 160V
R937 220
L932 2.2U
R936 1.5K 5W
R940 10K G.BGK
R939 100
S931
R935 100 1/2W
R992 330K 1/2W
C992 330P 2KV
V901
V901A S-B095
PWB-12998
NO.71035-2
79.05.23.

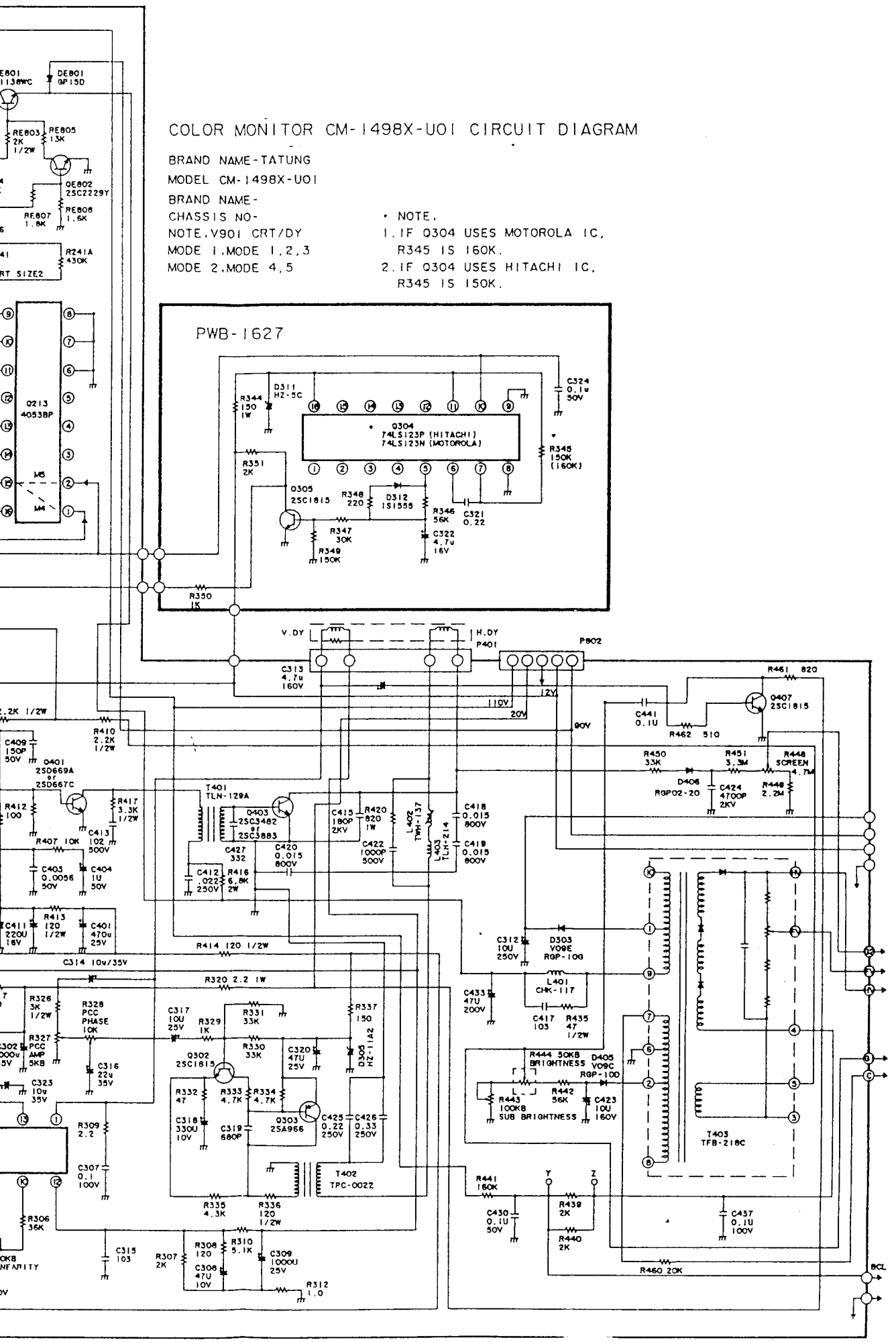

PWB-1299B
P502
BCL
B
G
R
S
R210 1K
R211 20K
Q204 2SC-458
D203 2.7V HZ3A2 BZX55C2V7
R212 1K
R213 1K
Q205-Q207 2SC535*3
Q207
Q206
Q205
R561 75
R531 75
R501 75
R216 1.1K
R215 1.1K
R214 1.1K
C531 100U 10V
C501 100U 10V
C561 100U 10V
C532 0.01
C562 0.01
C502 0.01
C596 330U 25V
C506 0.01
C505 47U
C591 0.01U
Q592 2SC458
R595 100
C593 47u 16V
D593 1S2076
R912 43
R911 430
C504 2.2U
R505 82K
R502 22K B.DRIVE
R503 6.2K
C536 0.01
C503 0.01
C535 47U
R596 10K
D596 1S2076
C594 0.22 63V
D594 1S2076
R597 47K
R941 430
R942 43
Q593 2SA844
R598 3K
D963 1S2076
C534 2.2U
R535 82K
Q501 M51387P
R532 22K G.DRIVE
R533 6.2K
C566 0.01
C533 0.01
C565 330U
R971 430
R972 43
D595 1S2076
C564 2.2U
R562 22K
R563 6.2K
R585 2.7K
R565 82K
C595 4.7U 16V R.DRIVE
R588 910 CONTRAST
R590 5K
R589 1.3K
P501
R587 13K
C563 0.01
D598 D5Z-15X
R586 5.1K
R599 5.1K


PWB-1561
COLOR MONITOR
BRAND NAME-TATUNG
MODEL CM-1498X-U01
BRAND NAME-
CHASSIS NO-
NOTE.V901 CRT/DY
MODE 1,MODE 1,2,3
MODE 2,MODE 4,5
PWB-1627
Q211 IR9331
Q212 C4557C
Q209 2SC1815
Q210 2SC1815
Q214 2SC1815Y
Q208 74LS138
Q202 74LS123 (FOR VERT. SYNC. DELAY USE)
Q213 4053BP
4053BP
Q201 HD 74L586
Q301 TDA-1670A
Q302 2SC1815
Q303 2SA966
Q401 2SD669A or 2SD667C
Q402 MC-1391
Q403 2SC3482 or 2SC3883
Q406 2SC458C
Q701 SE6322AK
Q801 D1136WC
Q802 2SC2229Y
DE801 GP15D
T401 TLN-129A
H.PHASE 1
H.PHASE2
H.HOLD 1
H.HOLD 2
INTERLACE ADJ.
VERT LINEARITY
VERT HOLD
V.CENTER
PCC PHASE
PCC AMP
V.SYNC.O/P
V.SYNC.IN
V.SYNC.DELAYED
V.SYNC.NON-DELAYED
V.DY
P202
PWB-1338
PWB-1561 NO.71038-1 79.08.23.

COLOR MONITOR CM-1498X-U01 CIRCUIT DIAGRAM

BRAND NAME-TATUNG
MODEL CM-1498X-U01
BRAND NAME-
CHASSIS NO-
NOTE.V901 CRT/DY
MODE 1.MODE 1,2,3
MODE 2.MODE 4,5

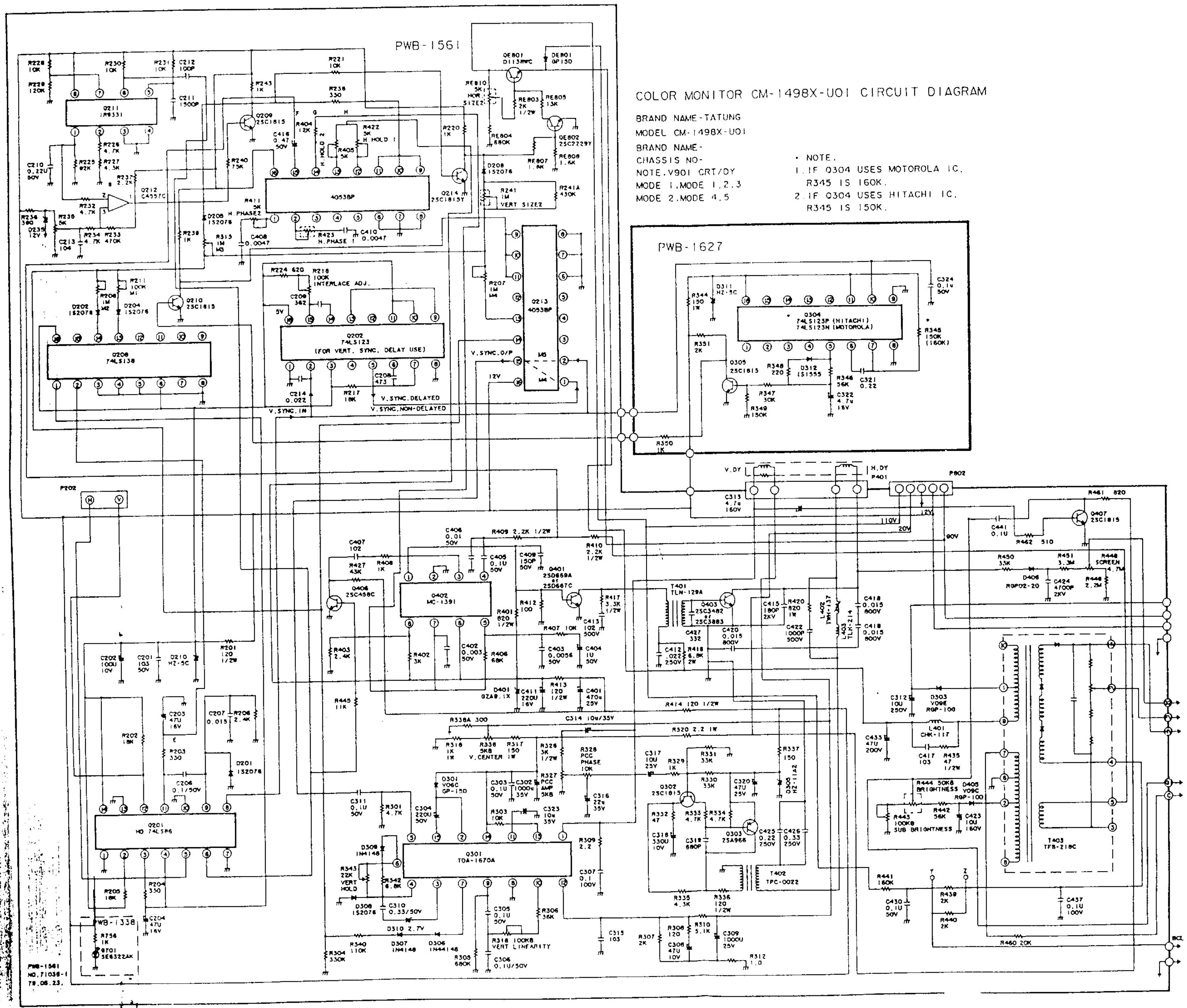
• NOTE.
1. IF Q304 USES MOTOROLA IC, R345 IS 160K.
2. IF Q304 USES HITACHI IC, R345 IS 150K.



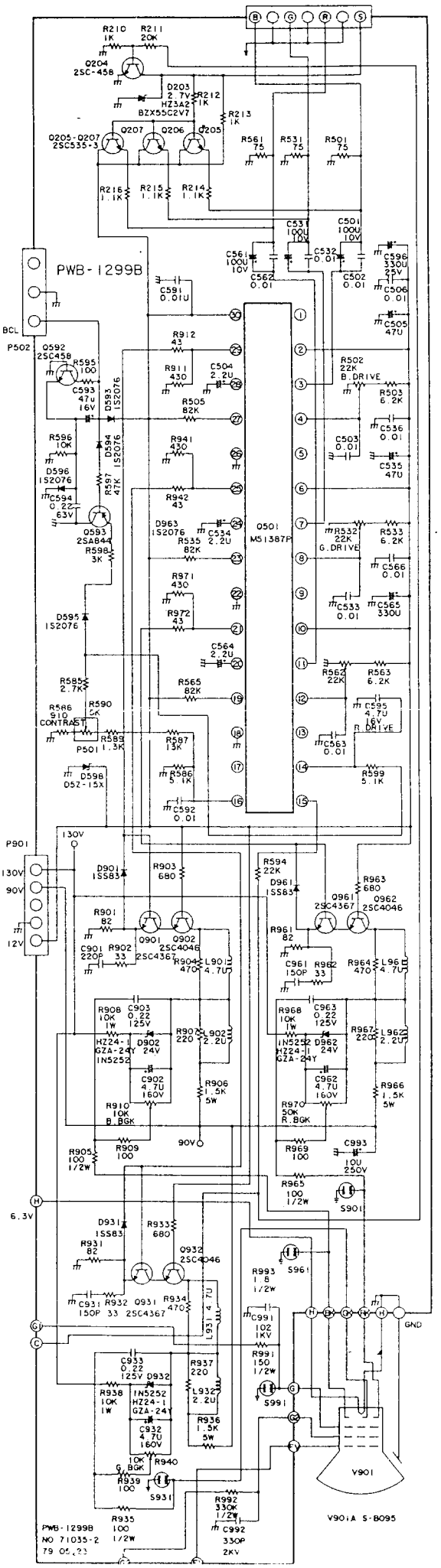
COLOR MONITOR CM-1498X-U01 CIRCUIT DIAGRAM

BRAND NAME-TATUNG
MODEL CM-1498X-U01
BRAND NAME-
CHASSIS NO-
NOTE.V901 CRT/DY
MODE 1.MODE 1,2,3
MODE 2.MODE 4,5

• NOTE.
1. IF Q304 USES MOTOROLA IC.
R345 IS 160K.
2. IF Q304 USES HITACHI IC.
R345 IS 150K.



PWB-1561
PWB-1627
PWB-1338
P202
P401
P802
H.DY
V.DY
Q201 HD 74LS86
Q202 74LS123 (FOR VERT. SYNC. DELAY USE)
Q206 74LS138
Q211 LM6331
Q213 4053BP
4053BP
Q301 TDA-1670A
Q304 74LS123P (HITACHI) 74LS123N (MOTOROLA)
Q402 MC-1391
T401 TLN-129A
T402 TPC-0022
T403 TFB-218C
V.SYNC.O/P
V.SYNC.IN
V.SYNC.DELAYED
V.SYNC.NON-DELAYED
R218 100K INTERLACE ADJ.
R318 100KB VERT LINEARITY
R338 5KB V.CENTER 1W
R328 PCC PHASE 10K
R327 PCC AMP 5KB
R343 22K VERT HOLD
R444 50KB BRIGHTNESS
R443 100KB SUB BRIGHTNESS
R448 SCREEN 4.7M
R241 1M VERT SIZE2
RE810 5K HOR. SIZE2
R422 5K H.HOLD 1
R423 H.PHASE 1
R411 5K H.PHASE2
PWB-1561
NO.71038-1
79.08.23.


PWB-1299B
PWB-1299B
NO 71035-2
79 05 23
V901:A S-8095
Q501
M51387P
P502
P501
P901
BCL
GND
130V
90V
12V
6.3V

COLOR DISPLAY CM-1496X/CM-1498X SERVICE MANUAL

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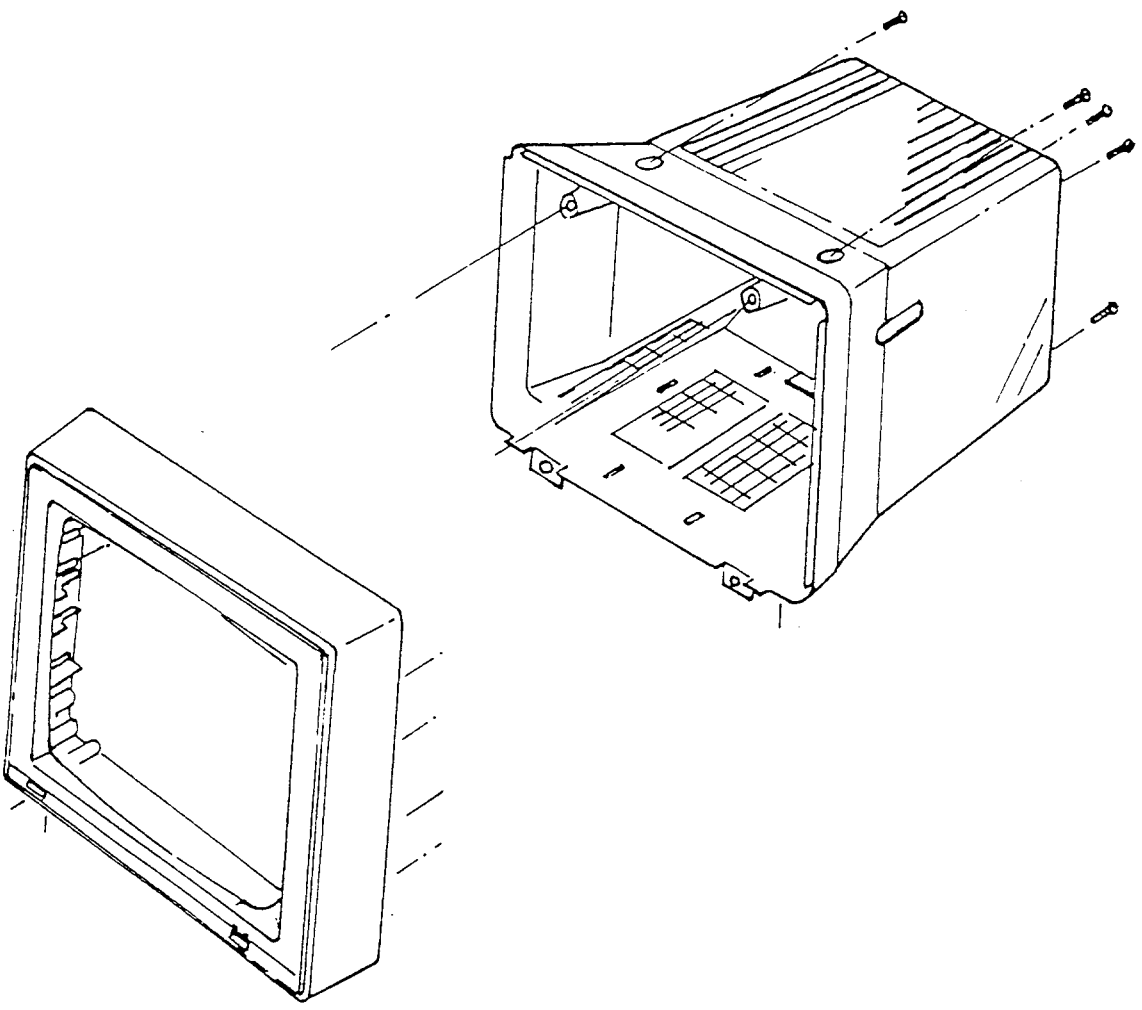
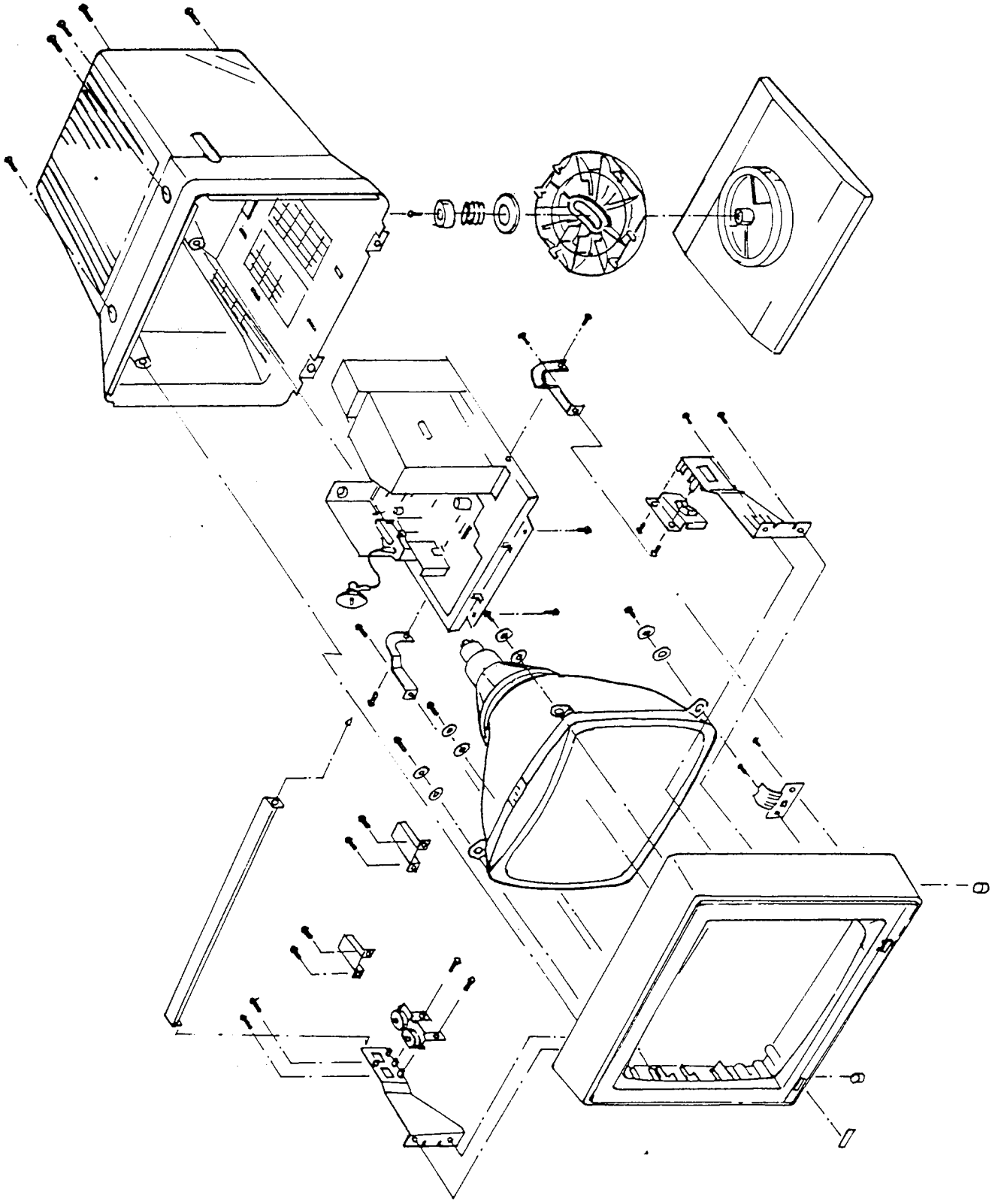
1.REMOVAL OF REAR COVER



****
* 2.MECHANICAL DISASSEMBLY *
****



* 3.TECHNICAL INFORMATION *

APPLICATIONS:	Analog R.G.B. input color display for graphics and alphanumeric use
POWER INPUT:	Mains voltage : 100 - 125/200 - 240VAC SWITCHABLE 50/60 Hz 1.0A(100 - 125VAC)/0.6A(200-240VAC)
VIDEO SIGNALS:	Red, green, blue, analog video signals input levels: 0 - 0.7Vp-p
SYNC. SIGNALS:	Vertical frequency : 53 - 90 Hz Horizontal frequency: 31.5 KHz/35.5 KHz
SIGNAL CONNECTOR:	Miniature D- shell male 15 Pin connector
DISPLAY TUBE:	14"(13V), 90 degree deflection, 0.31 mm dot pitch, (CM-1496X) ,0.28mm dot pitch, (CM-1498X) P22 phosphor, light transmission rate 46% reflectivity 45% - 65%
DATA AREA:	180 x 240 mm
LINEARITY:	6% Max.
MISCONVERGENCE:	Center: 0.3 mm Max. Corner: 0.5 mm Max. (CM-1496X) 0.4 mm Max. (CM-1498X)
WHITE COLOR: COODINATES	X: 0.313 Y: 0.329
USER CONTROLS:	Power ON - OFF switch, Brightness control (with center detent), contrast control H.PHASE 1,2,3 H.PHASE 4 H.SIZE 4,5 V.CENTER, V.SIZE 4,5 CONTROL
OPERATING AMBIENT:	Temperature: 0 - 35 C Relative humidity: 10 - 80%
WEIGHT:	12.5 kg (net)

****
* 4.GENERAL *
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CM-1496X/CM-1498X is a high resolution color display using a 0.31/0.28 mm dot pitch CRT with etched faceplate. Analog 16-levels R.G.B. video signals and TTL-level seperte sync. signals are adopted for graphic and text display.

It is designed to provied you with a wide range of compatibility with various industry graphic standards such as, the IBM VGA PS/2, super VGA 800X600, IBM 8514A 1024X768 and incorporates the automatic vertical sizing circuitry that provides automatic sizing resolution of 640X350 up to 1024X768.

A self-test pattern shall be available when the signal cable is disconnected from the driver source. The self-test pattern will consist of a full white raster extending beyond the display bezel at the top and bottom, with a vertical black bar on the left and/or right edges.

5. DESCRIPTION OF OPERATION

5-1 SWITCHING MODE POWER SUPPLY CIRCUIT

The TDA4601 is designed for driving controlling and protecting the switching transistor in flyback converter power supplies during start-up normal and overload operation as well as during disturded operation . In case of disturbance the drive of the switching transistor is inhibited and a secandary voltage rise is prevented.

A. The start-up procedures include three consecutive operating phase as follows:
   1. Build-up internal reference voltage
      The intenal reference voltage supplies the voltage regulator and effects charging of the coupling electrolytic capacitor cannected to the switching transistor.
   2. Enabling of internal voltage reference voltage V1=4V
      Simultaneously with va reaching approx 12V, an internal voltage becomes available providing all component elements, with the exception of the control logic with a thermally stable and overload resistant current supply.
   3. Enabling of control logic
      In conjunction with the generation of the reference voltage. The current supply for the control logic is activated by means of an additional stabilization circuit The integrated circuit is then ready for operation.

B. Normal operation mode/control operation mode
   At the input of Pin 2 the zero passage of the frequency provided by the feedback coil are registered and forwarded to the control logic Pin 3 (control input overload and standing identification) receives the rectified amplitude fluctcations of the feedback coil the control amplifier operates with an input voltage of approx 2V and a current of approx 1.4mA depending on the internal voltage reference.
   The overload identification limits in conjunction with collector current simulator Pin 4 the operating range of the control amplifier The collctor current is simulated by an external RC combination present at Pin 4 and internally set threshold voltage The largest possible collector current applicable with the switching transistor increase in propovtion to the increased capactance C808 thus the reguired operating range of the control amplifier is established the range of control lies between a DC voltage clamped at 2V and a sawtooth-shaped rising AC voltage which can vary up to a max amplitude of 4V (reference voltage) during secondary load reduction the switching frequency is increased and, Pin 5 it is possible to externally inhibit the operation of the IC, the output at Pin 8 will be inhibited when volltage of $\leqslant$ Vref -0.1V are present at Pin 5.
   And the base current amplifier forwards the sawtooth-shaped V4 voltage to the output of Pin 8. A current feedback with an external resistor R804 is present between Pin 8 and Pin 7, the applied value of the resistor determines the max amplitude of the base driving current for the switching transistor.

C. Protective operation mode
   The base current shut-down activated by the control logic clamps the output of Pin 7 to 1.6V. As a result the drive of the switching transistor is inhibited . This protective measure is enabled if the supply voltage at Pin 9 reaches a value$\leqslant$6.7 V or if voltage of $\leqslant \frac{Vref}{2}$

-0.1V are present at Pin 5.

5-2 AUTOMATIC DEGAUSSING CIRCUIT

Posistor R803 and degaussing coil L991 compose an Automatic Degaussing (ADG) circuit to demagnetic the shadow mask and internal shield in the CRT.

Posistor shows low resitance value in normal temperature, when apply AC line voltage, current of about 20 Ap-p flows into degaussing coil, after seconds, resistance of posistor increase rapidly due to rising in heat, degaussing current thus decrease to less than 120 m Ap-p, degaussing function is completed.

5-3 VERTICAL DEFLECTION CIRCUIT

The vertical sync. signal is applied to Pin 5 & Pin 4 of Q301. R342, R343, C310 connected to Pin 3 . Pin 4 and Pin 6 determin the free-running frequency of the oscillator inside Q301.

The resistance between Pin 7 of Q301 and ground defines the current mirror and then the height of the scanning.

Pin 9 of Q301 is output of the current mirror that changes the series of C305 and C306. This Pin is also the input of buffer stage.

Pin 10 of Q301 is the output of the buffer stage.

Pin 12 of Q301 is the inverting input of the amplifier.

R307 and R310 define the DC level across C309, so allowing a correct centering of the output voltage. R308 and C308 in conjuction with R307 and R310, applied at the feedback input Pin 12 of Q301, a small part of the parabola, available across C309, and the AC feedback voltage, taken across R312. R305, R308 and R310 produce the linearity correction on the output scanning current.

The output of power amplifier from the Pin 1 of Q301 drives the vertical deflection yoke by a negative slop current ramply, R309 and C307 are used to stabilize the power amplifier.

The supply voltage of the power output stage is forced at Pin 2. During the trace time the supply votage is obtained from the main supply votage by D301, while during the retrace time this Pin is supplied from the internal flyback generator.

Pin 15 is the output of the flyback generator that, when driven, jumps from low to high condition. An external capacitor C304 transfers the jump to Pin 2.

Pin 14 of Q301 is the main supply voltage input.

5-4 HORIZONTAL DEFLECTION CIRCUIT

The positive horizontal sync. pulse from Pin 6 of Q201 is converted and amplified by Q406. Then be applied through the differential circuit C407 / R408 to Pin 3 of the horizontal IC Q402.

The positive horizontal flyback pulse derived from Pin 5 of FBT T403 is integrated by the comparable sawtooth-waveform generator which is com-

posed of R410, R411, R423, C408, and C410, then be applied via C405 to Pin 4 of Q402.

The discriminator inside the IC Q402 detects the phase difference between the sync. input from Pin 3 and the sawtooth-waveforme from Pin 4 , the supperimposed pulse output from Pin 5 of Q402 is integrated by the low-pass-filter R407, C404 and C403, AFC voltage is obtained and applied via R406 to Pin 7 of Q402, thereby controlling the oscillator.

The oscillator inside IC Q402 is an RC type with Pin 7 used to control the timing. R404, R405, R422, C402 and C410 altogether determine the horizontal oscillating frequency.

The predriver output of Q402 is at Pin 1 of which duty cycle is controlled by R402 and R403 at Pin 8 of Q402.

Regulated voltage applied at Pin 6 of Q402 is about 8 - 9 volts.

The output signal from Pin 1 of Q402 is then amplified by Q401 and coupled by T401 to the horizontal output stage Q403 for ON-OFF control, thus sawtooth-waveform current through the horizontal deflection coil is obtained.

Also during the retrace time of the horizontal deflection, a horizontal flyback pulse of about 1100 volts is produced at the collector of Q403, this pulse is transfered and rectified by the FBT T403 to obtain high voltage of about 22.0KV for anode of CRT.

5-5 DPC CIRCUIT

The Side Dynamic Pincushion Correction circuit (Side DPC) modulates the raster width as a function of vertical deflection .

The vertical castle-waveform from Pin 1 of Q301 is integrated by C314, R326, R327, R328, C316 etc. to produce a parabolic waveform necessary for side pincushion correction, this parabolic voltage is amplified by Q302 and Q303 stages and then drives the control winding of the saturable reactor T402.

The inductance of the T402 output winding is modulated by the vertical parabolic current, this output winding is inserted in series with the horizontal deflection yoke.

The horizontal yoke current is then modulated by the correction voltage to correct side pincushion distortion.

5-6 VIDEO CIRCUIT

The color display contains three video amplifiers, one for each primary color, these three amplifiers for the red, green and blue CRT guns are identical.

Video amplifier consists of preamplifier Q501 (M51387P), output stage and cut off adjustment circuit.
The operation of only one channel (blue) is described here.
Analog video signals is preadjusted by R502 and coupling VIA C501, C502 to input of Q501.

Contrast is DC controlled from Pin 14 of Q501, clamp pulse provided from Pin 7 of FBT (T403) to P15 of Q501. The output of Q501 is at Pin 21.

C504 is used for clamp pulse to charge.

The B+ of preamp. (12V) and output stage is provided from S.M.P.S.

The composite blanking pulse is provided from vert. circuit to Q407.G1 clamp the Blanking level to A suitable position.

5-7 MODE CONTROL CIRCUIT

(1) HORIZONTAL FREQUENCY DETECT
H.Sync. pulse with different frequency was sent to Pin 6 of Q211 (F/V CONVERTER) Then there are different voltage at the output Pin 1. So we get a "HIGH" at Pin 1 of Q212 when Hor. freg. is 31.5KHz and "LOW" when Hor. freq. is 35.5KHz. This signal can be used to control Hor. width, Hor. osc. freq., Hor. phase.

(2) HOR. WIDTH CONTROL
When Hf=31KHz, Q212#1 is "H", Q209#C is "L", Q214#C is "H", QE802#C is "L", QE801#B is "L", QE801 cutoff, then DE801 is conducted and 90VDC was sent to FBT #9. When Hf=35KHz, QE801 is conducted and 105VDC is sent to FBT#9 and DE801 is cutoff. Adjusting RE810 can change the base current of QE801, then change the output of QE801 so as Hor. width when Hf=35KHz.

(3) HOR. OSC. FREQ. CONTROL
When Hf=31KHz, Q212#1 is "H", Q209#C is "L", Q203#9#10#11 is "L", then #12#14# are connected. When Hf=35KHz Q203#13#14 are connected, the time constant of Hor. osc. circuit will be changed.

(4) HOR. PHASE CONTROL
When Hf=31KHz, Q203#15#2 are connected. When Hf=35KHz, Q203#15#1 are connected.

(5) VOLTAGE AT POSITIVE END OF C204(POINT "D") and C203(POINT "E")
Q201 74LS86 is an XOR LOGIC IC, If the input pulse of #2 is positive, #3 also positive. This pulse will be filtered by C204 to get a "L" at point"D. However a negative pulse will be filtered as a "H". It's the same condition at point "E". (See tabe 1 for reference). The output at #8 and #6 are always positive for easy sync.

	H.SYNC.	V.SYNC.	POINT "D"	POINT "E"
MODE 1	+	-	L	H
MODE 2	-	+	H	L
MODE 3	-	-	H	H

TABLE 1

(6) SIZE CONTROL OF MODE 3
Q208 74LS138 is a 3-to-8 decoder (Multiplexer). When fH=31KHz, Q209#C is "L", D205 is conducted. Adjusting R315 can vary the picture size of mode 3. From table 1 we can know that Q208#1#2 are "H", so that Q208#13#14 are "H", D202/D204 are cutoff R208/R211 are disabled. Since Q214#C is also "H" R241/R207 are also disabled too.

(7) SIZE CONTROL OF MODE 2
From table 1, D/E are H/L, Q208#14 is "L", D202 are conducted. Adjusting R208 can vary picture size R315 has to be preseted before adjusting R208 since R208 is parallel to R315 now.

(8) SIZE CONTROL OF MODE 1

Q208#13 is "L", R211 is availabe and parallel to R315

(9) SIZE CONTROL OF MODE 4
Q304(PWB-1627) 74LS123 is a monostable multivibrator. We use it to delay the sync. pulse. In mode 4, the period of vertical sync. is around 11.6mS. When We delay that pulse for 11.6mS, it becomes a DC voltage. The DC voltage from Pin 5 will make Q305 saturated. When Q305#C is "L", Q210#C is "H", then Q213#14#13 are connected. R207 is available and parallel to R340, (R241 is always available when fH=35KHz) and in series to R241.

(10) SIZE CONTROL OF MODE 5
When the period of sync. pulse is much longer than 11.6mS (e.g 18mS) There is a negative pulse at Q304#5. Once the pulse in "L" condition, C322 will discharge by the way of D312 . So, C322 cannot have enough voltage to saturate Q305 Then, Q213#14#13 will disconnected and R207 is disabled. Only R241 is available for adjusting.

5-8 SELF TEST

Self test signal suppied from heater buffered by Q205, Q206, Q207 and via R214, R215, R216 to the video input to generate full white screen with black vertical bar on the left and/or right edges. When the display is connected to a system unit the collector of Q204 is grounded to make a dark screen.

5-9 SIGNAL CABLE PIN CONNECTIONS:

Pin	Signal	Pin	Signal
1	Red Signal	9	No Pin
2	Green Signal	10	Digital Ground
3	Blue Signal	11	Jumper to Pin 10
4	Jumper to Pin 10	12	No Pin
5	Self-test	13	Horizontal Sync.
6	Red Return	14	Vertical Sync.
7	Green Return	15	No Pin
8	Blue Return		

6. ALIGNMENT PROCEDURE

6-1 EQUIPMENTS

1. Manual degaussing coil
2. Oscilloscope + probe
3. Digital voltmeter
4. Color analyzer
5. Ruler
6. EHT meter with high voltage probe

6-2 POWER SUPPLY OUTPUT VOLTAGE

Connect a DVM to S.M.P.S. output red wire adjust the voltage to 90V by means of R813.

6-3 VERTICAL FREQUENCY

Connect a frequency counter across the vertical deflection coil. adjust the frequency. To 49Hz by means of R314, the signal cable must be disconnected from the PC.

6-4 HORIZONTAL FREQUENCY

Use a test pattern. Without horizontal sync. input, adjust R422(31.5KHz) and R405(35.5KHz) to get the color bar in an upright position.

6-5 PINCUSHION

Straighten the side lines with R327 and R328.

6-6 WIDTH

Adjust the data area width to 240 +/- 5 mm using L402. (fH=31.5KHz)

6-7 VERTICAL CENTERING

Center the data area with R338.

6-8 VERTICAL LINEARITY

Adjust the squares equal in height with R316.

6-9 HEIGHT 3 (480 lines)

Adjust data area height to 180 +/- 5 mm with R315.

6-10 HEIGHT 2 (400 lines)

Switch to 400 lines mode . Adjust data area height to 180 +/- 5 mm with R208. (Be sure that height 3 has been adjusted)

6-11 HEIGHT 1 (350 lines)

Switch to 350 lines mode . Adjust data area height to 180 +/- 5 mm with R211. (Be sure that height 3 has been adjusted)

6-12 HEIGHT 5 (600 lines)

Switching to 600 lines mode . Adjust data area height to 180 +/- 5 mm with R241.

6-13 HEIGHT 4 (768 lines)

Switching to 768 lines mode . Adjust data area height to 180 +/- 5 mm with R207. (Be sure that height 5 has been adjusted)

6-14 FOCUS ADJUST

Adjust FBT focus VR to get best overall focus screen.

6-15 WHITE X/Y

Turn the brightness VR to center detent position, contrast VR to minimum. Set cut-off drive VR R910/R940/R970 to center.

Turn the sub-brit. VR R443 to a position where to get the G1 voltage is -25V.

Turn the G2 control to a position where to get the brightness just disappears.

Turn the brightness VR to max. and adjust the R910,R940 and R970 to achieve the color coordinates X=0.313 Y=0.329 roughly and brightness 0-5 F.L.

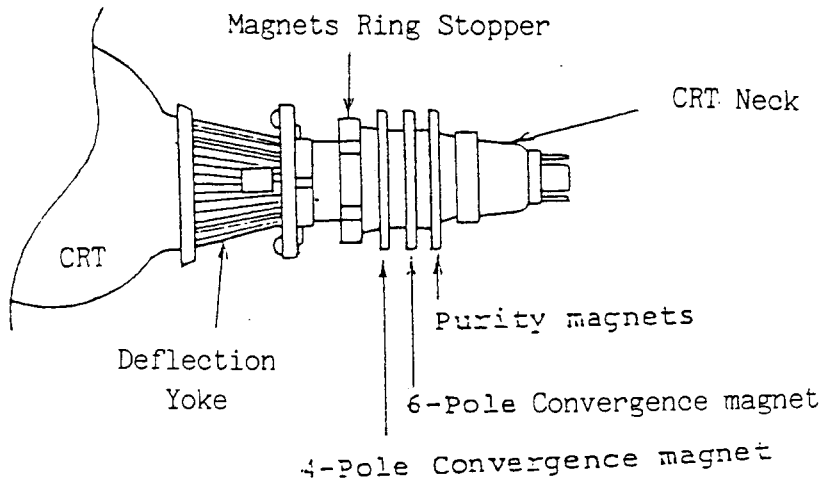
Use full field white pattern, turn the contrast to maximum, brightnes at detent, adjust R502, R532 and R562 to achieve the correct X,Y coordinates. Then turn contrest VR to get 3 F.L. Adjust R910/R940/R970 to achieve correct X,Y coordinates.

6-16 F/V CONVERTER ADJUSTMENT: (MODE 3, FULL WHITE SIGNAL)

Adjsut R235 VR to get 0.7V +/- 0.1 between #P2 (+) and #P1 (-) or between Q212#3(+) and Q212#2(-) after warm up the set for 20 minutes.

6-17 INTERLACE ADJUSTMENT:

Receiving 1024x768(interlaced) signal, display small "s" character. Adjust R218 so that small "s" is not distorted.



6-18 STATIC CONVERGENCE ADJUSTMENT:

NOTE: Before attempting any convergence adjustment, the display should be operate for at least thirty minutes.

(1) Apply the crosshatch pattern to the display.
(2) Adjust the BRIGHTNESS and CONTRAST controls for well defined pattern.
(3) Refer to the structure of picture tube (See Fig 6-1) to make sure the relative position of the convergence magnet.

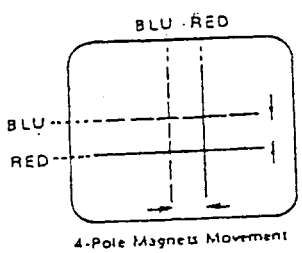


Fig 6-2

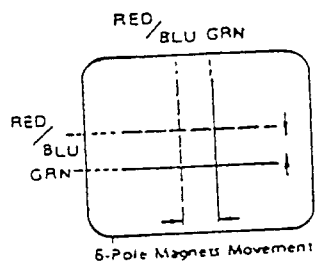
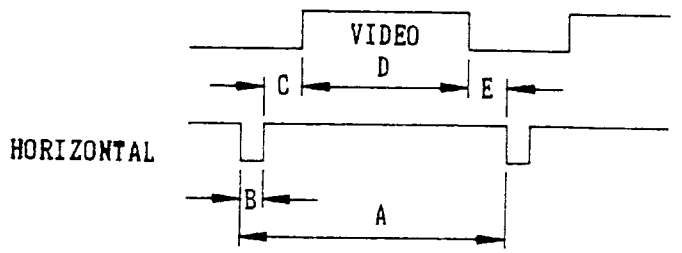
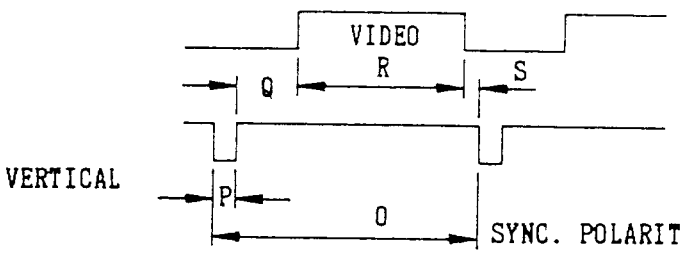


Fig 6-3

(4) Adjust two tabs of the 4-pole Magnets to change the angle between them and superimpose red and blue vertical lines in the center area of the picture (See Fig 6-2).
(5) Turn both tabs at the same time keeping their angles constant to superimpose red and blue horizontal lines at the center of the screen (See Fig 6-2)
(6) Adjust two tabs of 6-pole Magnets to superimpose red/blue line with green one. Adjusting the angle affects the vertical lines and rotating both magnets affects the horizontal lines. (See Fig 6-3)
(7) Repeat adjustments (4). (5). (6). until best convergence is obtained.

6-17 TIMING CHARTS





SYNC. POLARITY : POSITIVE/NEGATIVE

PRE-SET TIMING

	VGA/PS2 COMPATIBLE			8514/A COMPATIBLE	800X600
fH	31.5 KHz			35.52KHz	35.16KHz
Aus	31.77			28.15	28.44
Bus	3.77			3.92	2
Cus	1.89			1.25	3.56
Dus	25.17			22.8	22.22
Eus	0.94			0.18	0.67
Fr	70Hz		60Hz	87 Hz	56 Hz
Oms	14.27	14.27	16.68	11.5	17.78
Pms	0.064	0.064	0.064	0.113	0.06
Qms	1.88	1.08	1.02	0.563	0.6
Rms	11.126	12.716	15.246	10.81	17.07
Sms	1.2	0.41	0.35	0.014	0.03

REMARKS	SEPARATE SYNC. H.SYNC. POSITIV V.SYNC. NEGATIVE	SEPARATE SYNC. H.SYNC. NEGATIVE V.SYNC. POSITIVE	SEPARATE SYNC. H.SYNC. NEGATIVE V.SYNC. NEGATIVE	INTERLACED SEPARATE SYNC. H.SYNC. POSITIVE V.SYNC. POSITIVE	SEPARATE SYNC. H.SYNC. NEGATIVE V.SYNC. NEGATIVE	H.SYNC. POSITIVE V.SYNC. POSITIVE

****
* 7.TROUBLE SHOOTING *
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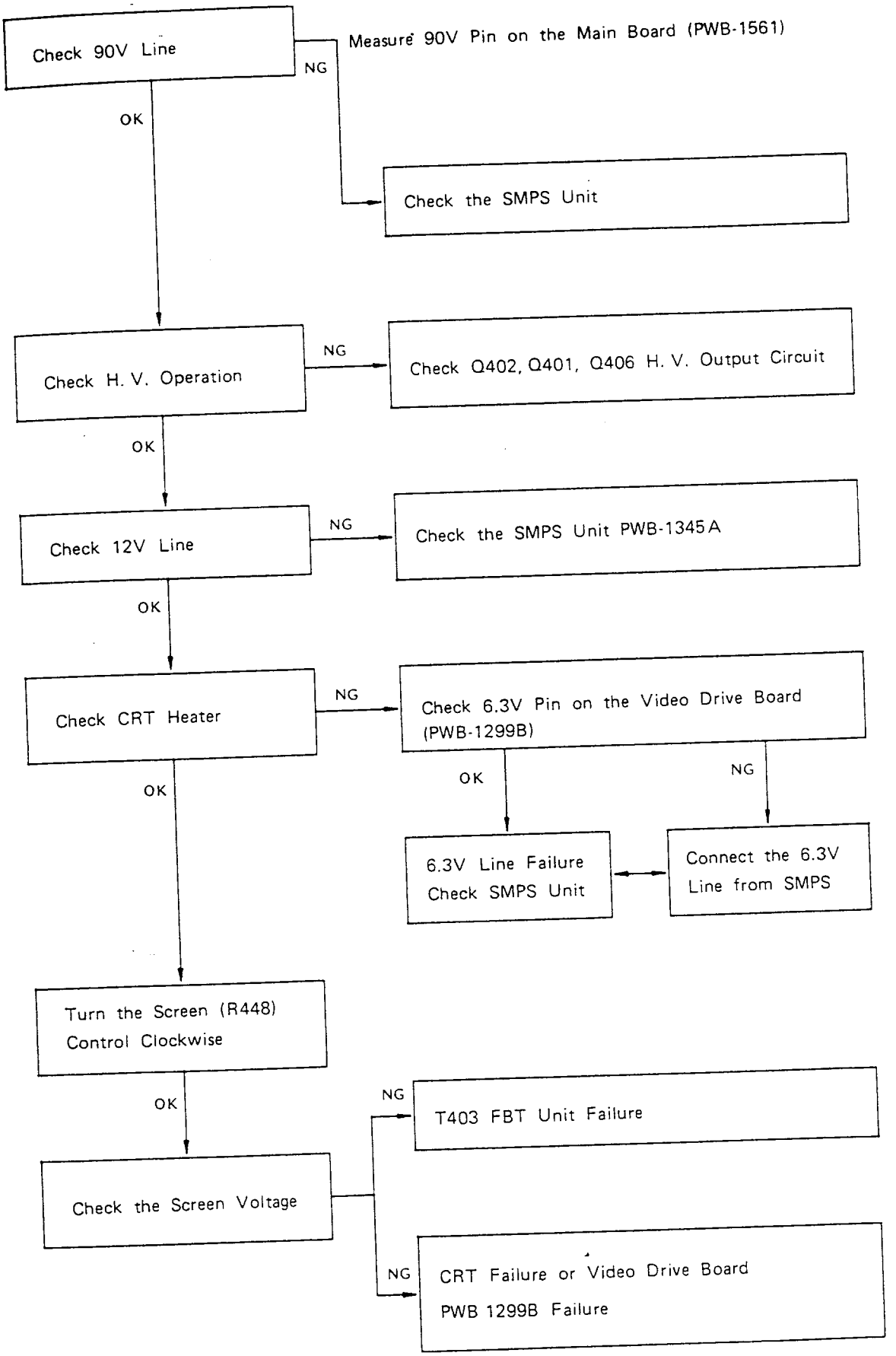
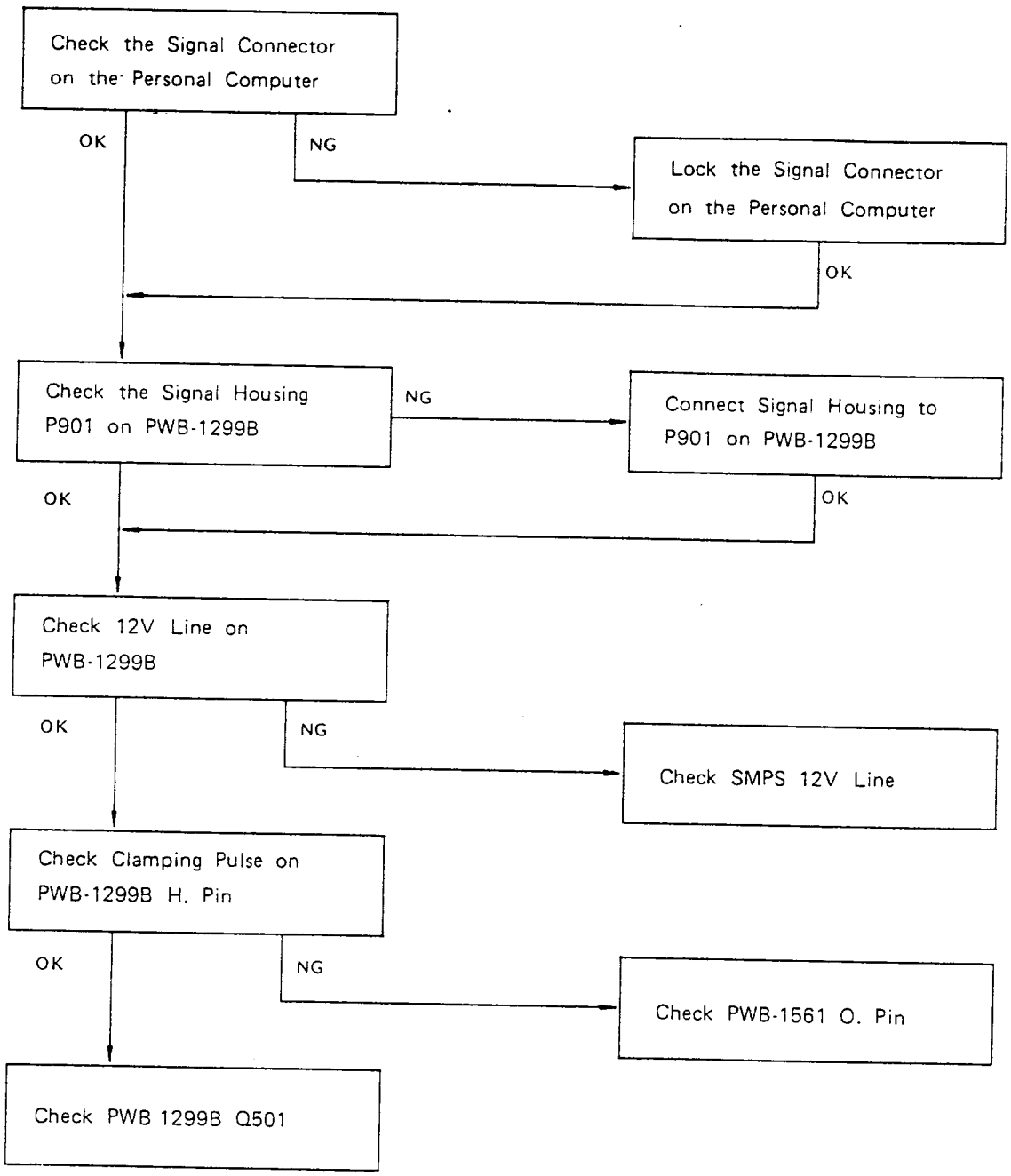
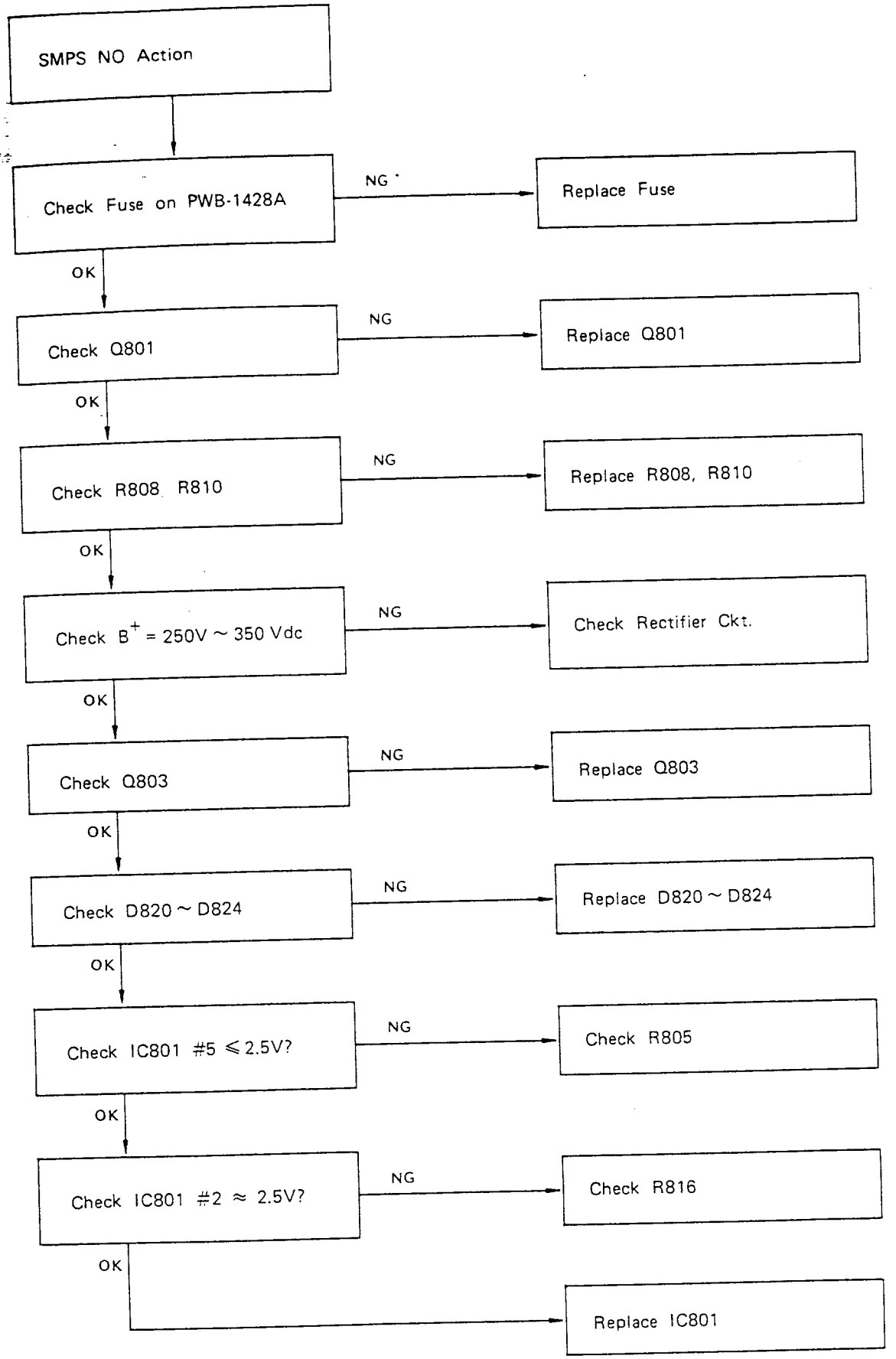
No Raster



No Picture on the CRT




SMPS NO Action
Check Fuse on PWB-1428A
NG
Replace Fuse
OK
Check Q801
NG
Replace Q801
OK
Check R808 R810
NG
Replace R808, R810
OK
Check B+ = 250V ~ 350 Vdc
NG
Check Rectifier Ckt.
OK
Check Q803
NG
Replace Q803
OK
Check D820 ~ D824
NG
Replace D820 ~ D824
OK
Check IC801 #5 ≤ 2.5V?
NG
Check R805
OK
Check IC801 #2 ≈ 2.5V?
NG
Check R816
OK
Replace IC801